

Fishery Management Report No. 91-1

Annual Management Report for Sport Fisheries in the Arctic-Yukon-Kuskokwim Region, 1987

by

**William D. Arvey,
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James F. Parker,
and
Alfred L. DeCicco**

April 1991

Alaska Department of Fish and Game

Division of Sport Fish



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¹ Some of the data included in this report were collected under various jobs of project F-10-3 of the Federal Aid in Fish Restoration Act (16 U.S.C. 777-777K).

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ABSTRACT

This report presents a compilation of information on the recreational fisheries of northern, northwestern, western, and interior Alaska, an area referred to as the Arctic-Yukon-Kuskokwim Region. Important species to the sport fisheries in this region are identified, zoogeographic distribution of species is discussed, as is stock status and harvest data from the 1987 calendar year. Regulatory actions affecting the regional sport fishery in 1987 are described along with other management, research, stocking, and enhancement activities. Climatic factors of importance to area fisheries are summarized and federal land status within the region is described.

KEY WORDS: Arctic, Yukon, Kuskokwim, Tanana River, sport fishery, recreation, harvest, effort, abundance, regulations.

PREFACE

This report is the second in a series of annual management reports for Sport Fisheries in the Arctic-Yukon-Kuskokwim Region. It is intended as an annual compilation of information on sport fisheries activities including management, research, regulation development and changes, enhancement, and habitat monitoring occurring in the region during the reporting year. The reader is advised to consult other regional reports for specific project information, or, for more abbreviated fisheries summaries, the reader should consult regional reports to the Alaska Board of Fisheries. A brief summary of all reports completed by regional staff during the reporting year with information on how the reader may access them is included later in this report under the section entitled "Synopsis of major sport fisheries research in 1987".

The report is designed to document and provide an historic record of the Region's recreational fisheries, to document regulatory changes and other natural and man-influenced factors that may affect fish survival and production during the reporting period. Those factors may include such phenomena as unusual rain or snowfall patterns that affect stream flows, or in-stream disturbances that influence water turbidity and primary production. In addition, harvest, catch and effort statistics for the reporting year are presented along with available information concerning stock status and long term trends in abundance or exploitation.

INTRODUCTION

The Arctic-Yukon-Kuskokwim Region (AYK Region), encompasses the majority of the landmass of the state of Alaska, (Figure 1). Within the region are included some 1,061,000 km², the state's largest river systems (Yukon, Kuskokwim, Colville, and Noatak), thousands of lakes, and thousands of miles of coastline and streams. It essentially includes all waters between Cape Newenham in the southwest, (excluding Kuskokwim Bay and the lower Kuskokwim River), the Alaska Range in the south, the Arctic Ocean in the north, and the Canadian border in the east (Figure 1). The region as a whole is very sparsely populated, with the exception of population centers located in the Tanana River valley. Fairbanks is the largest of these communities, containing approximately 72,000 people within the Fairbanks North Star Borough Census Area. Other population centers in the region include the Yukon-Koyukuk Census Area with 9,100 people, the Nome Census Area with 7,800 people, the Southeast Fairbanks Census Area with 6,900 people, the Northwest Arctic Borough with 5,800 people, the Wade Hampton Census Area with 5,600 people, and the North Slope Borough with 5,500 people (Alaska Department of Labor 1987).

For fishery management purposes, the regional sport fishery program is divided into the Tanana and AYK areas. The Tanana Area (also called Fairbanks Area) receives management area status because of the greater impact of its larger human population base upon local fishery resources and the need to conduct more intensive stock specific studies to provide managers with needed biological information.

TANANA AREA DESCRIPTION

The Tanana Area is also described as the Fairbanks Area in the statewide harvest report (Mills 1987), and it includes all southern drainages of the Yukon River from its confluence with the Tanana River near Tanana, east to the Canadian border and including the Alaskan portion of the Fortymile and Sixtymile River drainages as well as the entire Tanana River watershed. This area also includes the Alaskan portion of the White River drainage. Although the Tanana Area, for purposes of the statewide harvest report, includes more than just the Tanana River drainage, area management responsibilities of the Tanana Area staff are limited to the Tanana drainage. Management responsibility for all Yukon River drainages except the Tanana River drainage is assigned to the AYK Area management staff.

Geographic and Geologic Setting

The Tanana River basin (Figures 2 - 6) is an area of approximately 113,900 km² (11.4 million ha). The main river is a large glacial stream formed at the confluence of the Chisana and Nebesna rivers near Tok. After flowing downstream in a general northwesterly direction for some 917 km, it meets the Yukon River at Tanana. It is the second largest tributary of the Yukon River; the Porcupine River is slightly larger. The Tanana River receives both the majority of its flow as well as its largest sediment loads from streams draining the glaciers of the Alaska Range and the Wrangell Mountains. All major tributaries flowing into the north side of the Tanana River originate in

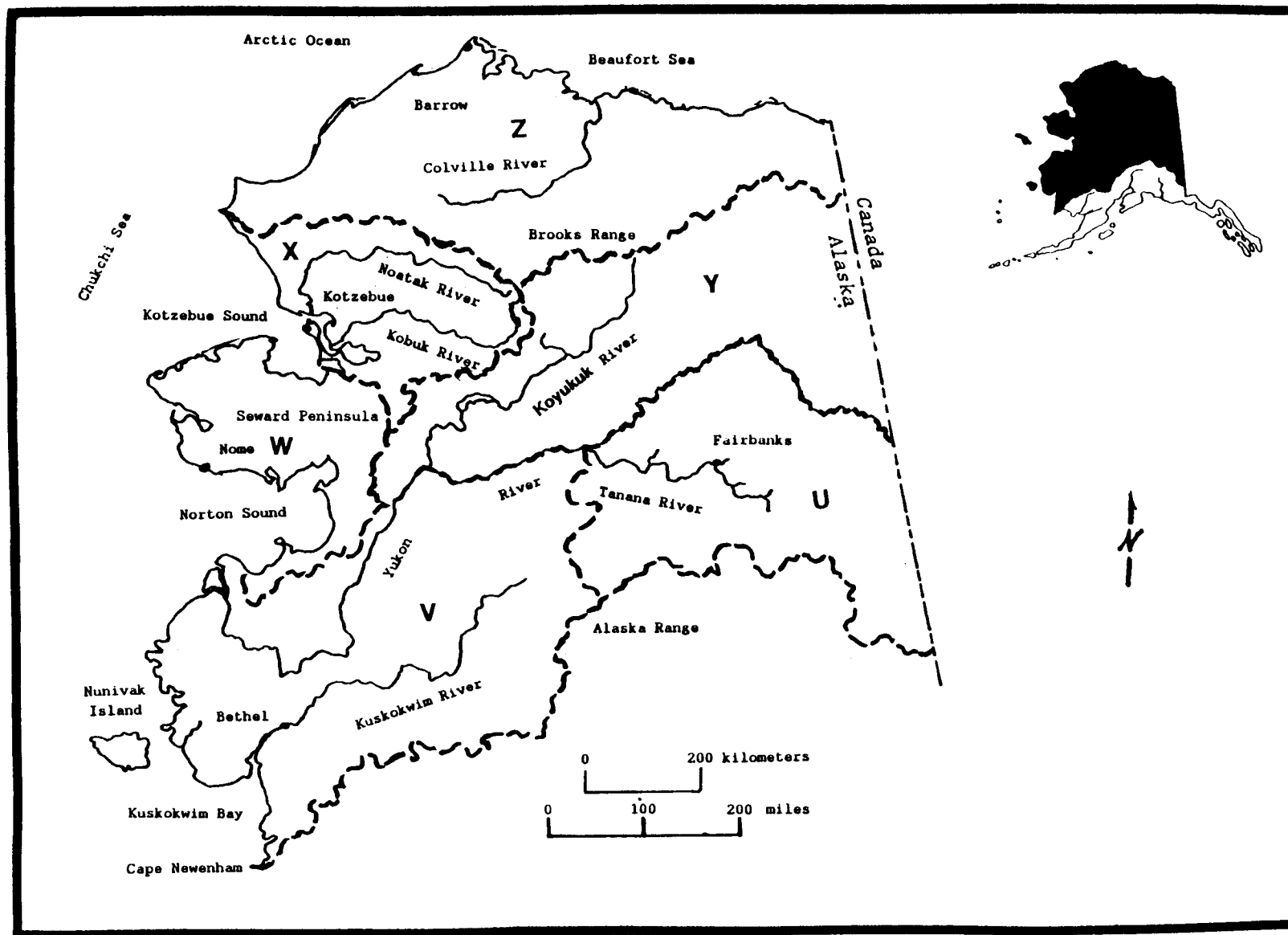


Figure 1. The Arctic Yukon Kuskokwim Region. Dashed lines indicate boundaries between harvest reporting areas U - Z

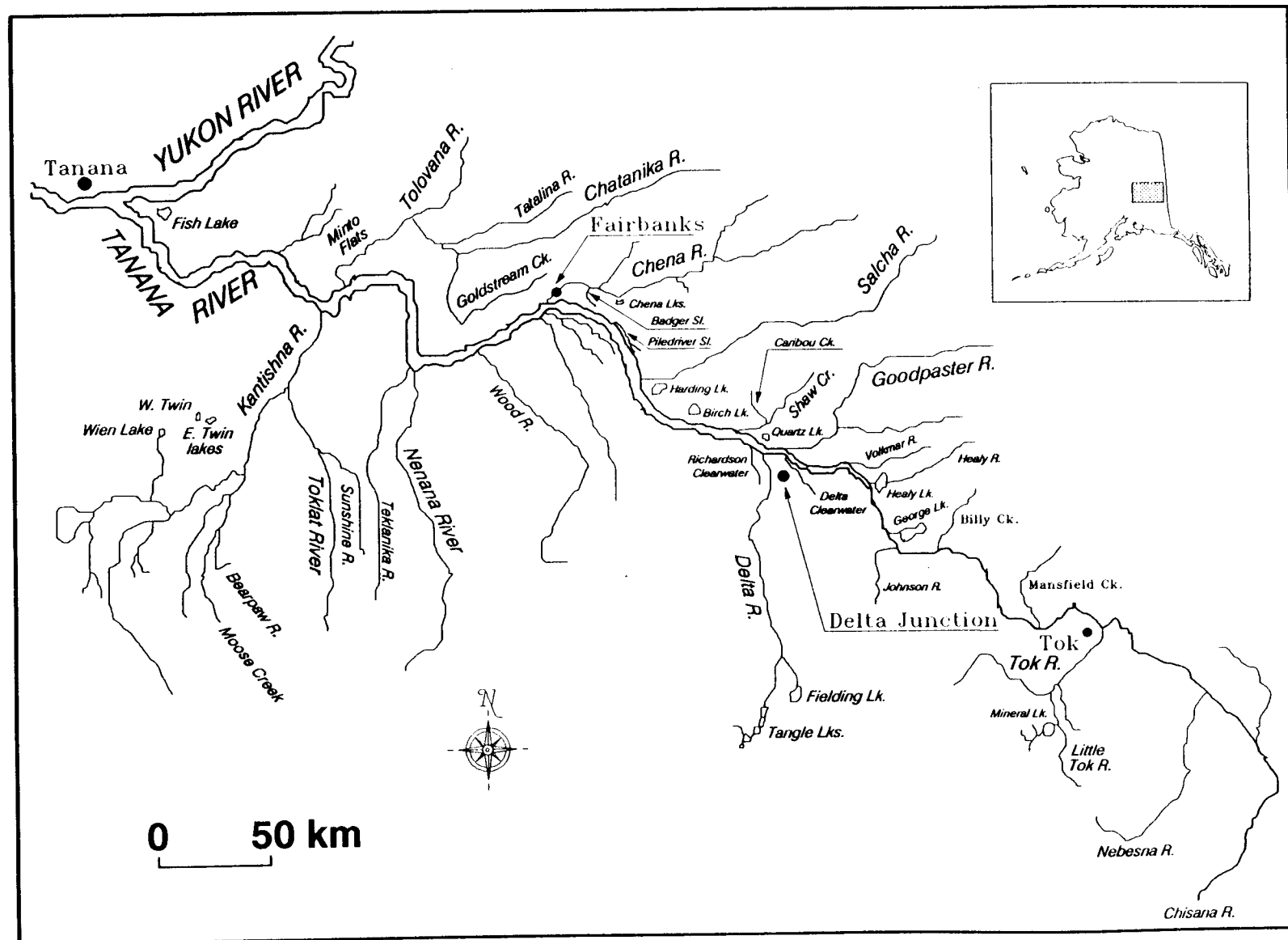


Figure 2. The Tanana River drainage.

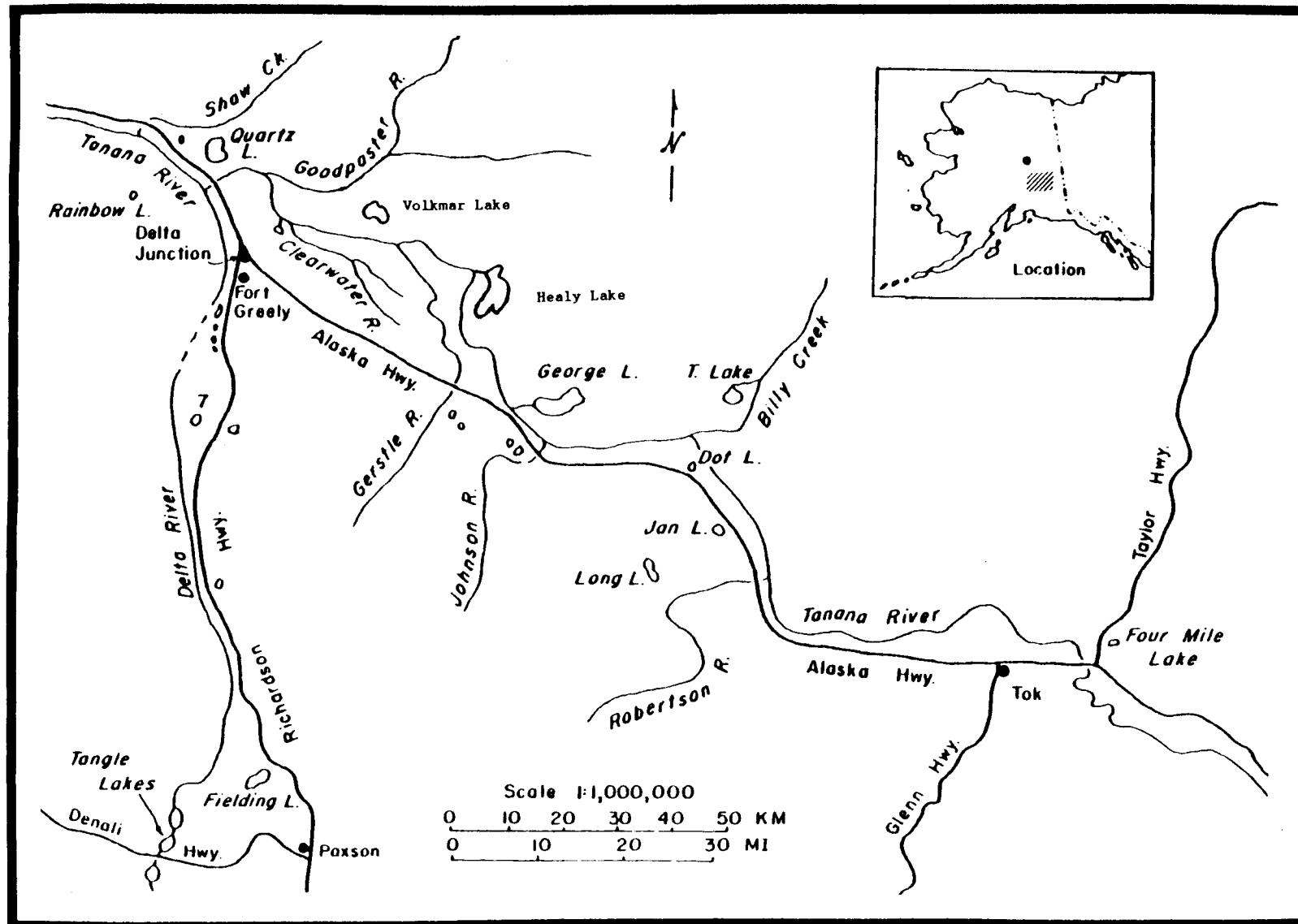


Figure 3. Waters and highways of the middle Tanana River valley.

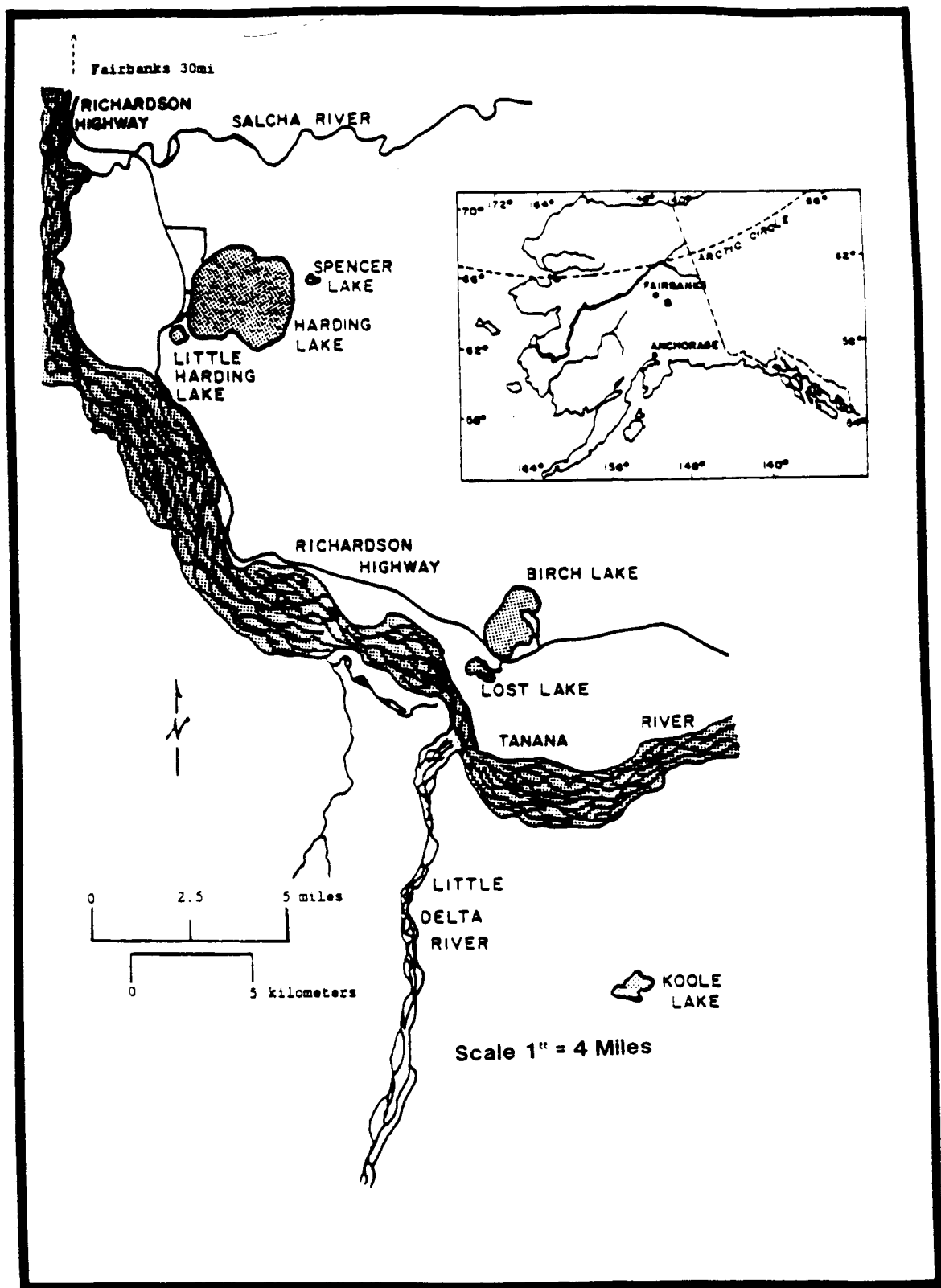


Figure 4. Tanana River waters near Fairbanks.

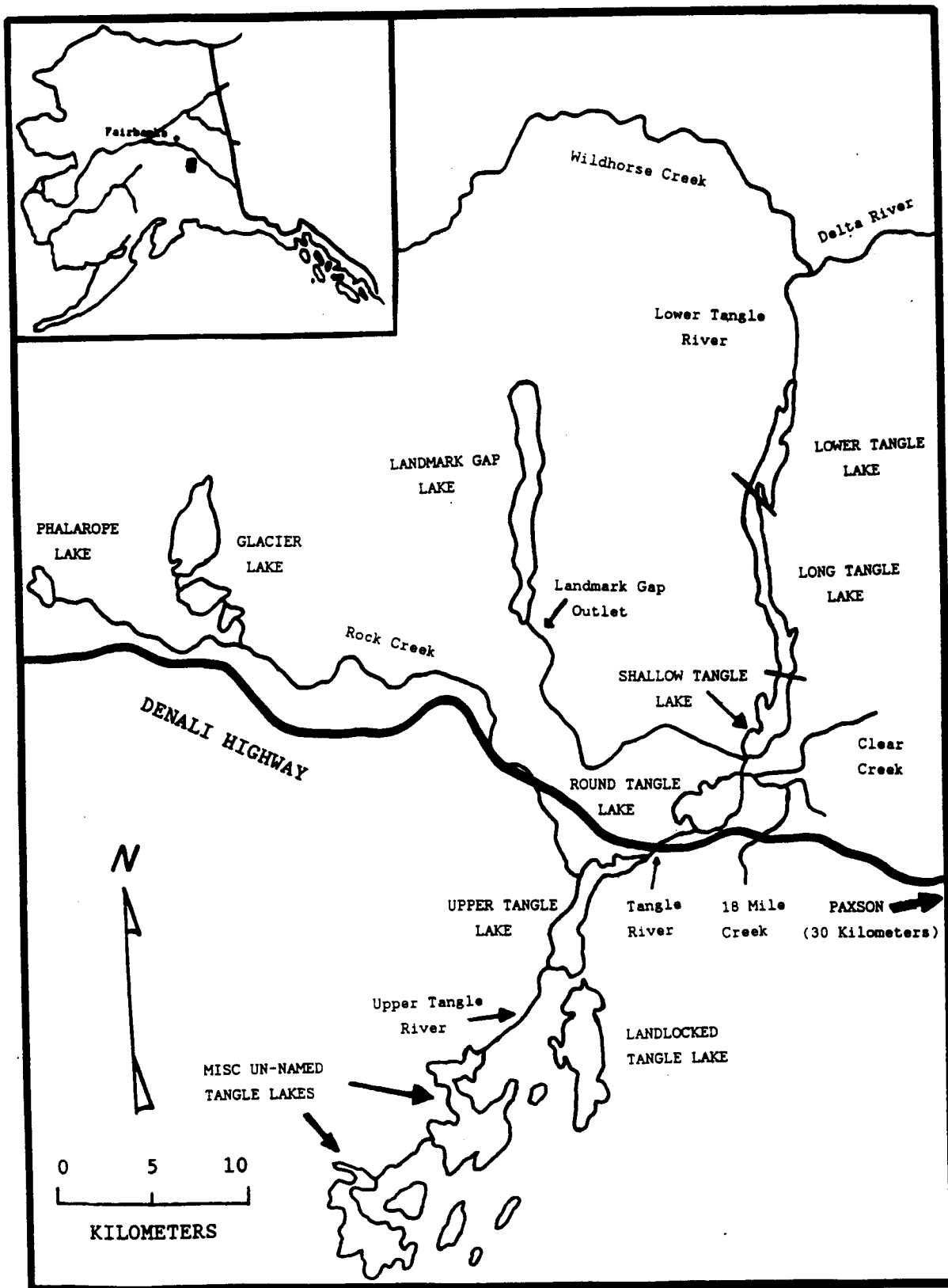


Figure 5. Map of the Tangle Lakes system.

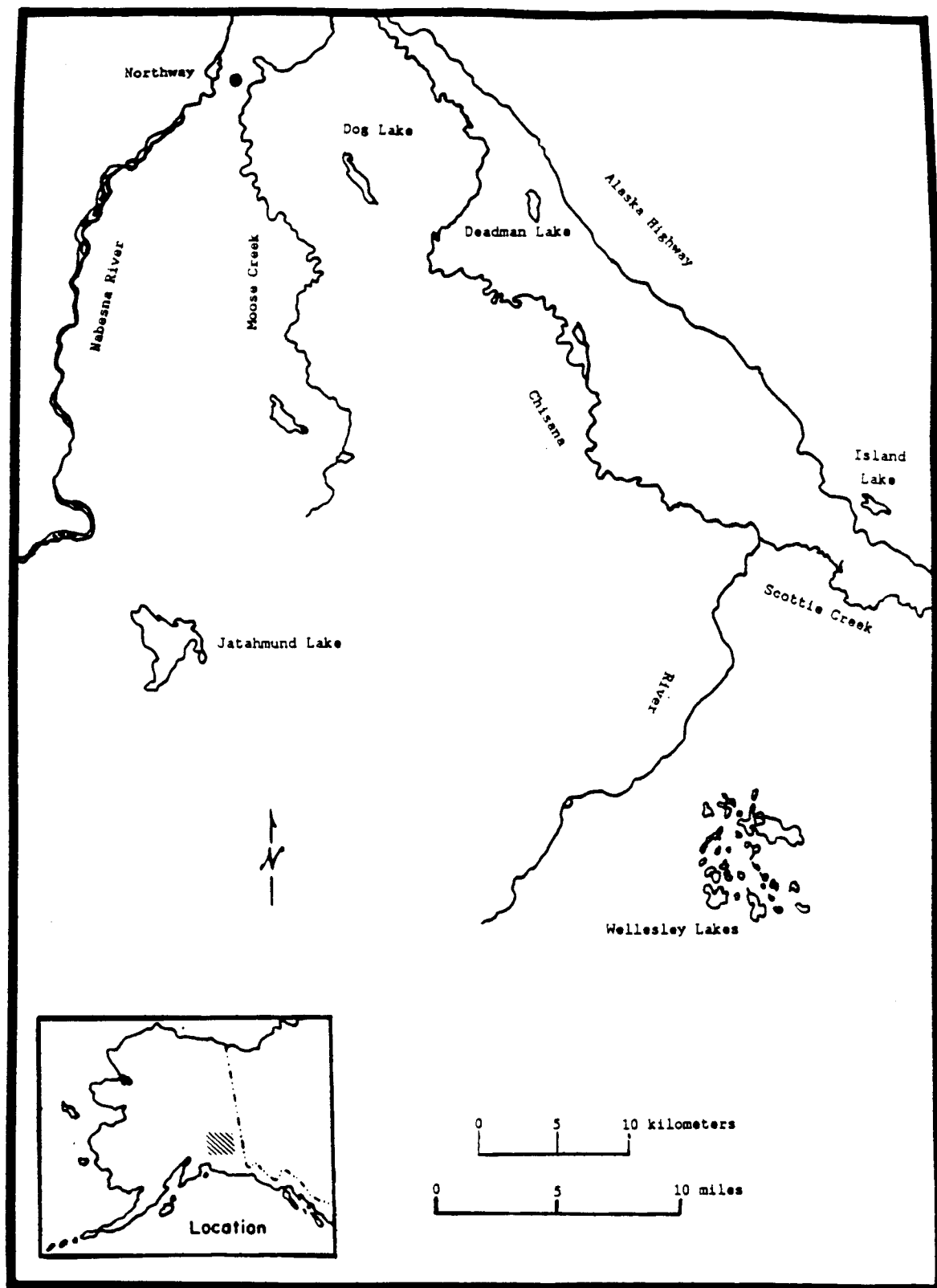


Figure 6. Tributaries of the upper Tanana River.

the Tanana Hills uplands and are clear water streams in both winter and summer. They include the Goodpaster, Salcha, Chena, Chatanika, and Tolovana rivers. Rivers flowing from the Alaska Range and the Wrangell Mountains and entering the south side of the Tanana River are of glacial origin. They include the Chisana, Nabesna, Tok, Delta, Nenana, Kantishna, and Toklat rivers.

The Tanana Area (statewide harvest survey definition) also includes the north slope drainage of the White Mountains north of Fairbanks. Included are Birch Creek and its tributaries, and Beaver Creek, both of which empty into the Yukon Flats between Circle City and the Dalton Highway crossing of the Yukon River near Stevens Village (Figure 7). This area is contained within the Yukon Flats National Wildlife Refuge. Upstream from Circle City to the Canadian border, the Charley, Seventymile, and Alaska portions of the Forty mile rivers are included in the area. The Yukon-Charley National Wildlife Preserve encompasses much of the Yukon drainage upstream of Circle City to the border, including the streams just listed (Figure 8).

Lake and Stream Development

Large alluvial aquifers associated with porous floodplain gravels influence fish production by storing water and providing more stable winter stream flows in the Upper Tanana River and some of its tributaries from Delta Junction upstream and in the Toklat River, tributary to the Kantishna River. All the large aquifers are located on the south side of the Tanana River and are associated with subterranean water flows from the north slope of the Alaska Range. The Delta Clearwater and Richardson Clearwater rivers (Figure 2) are the most important sport fishing streams that originate from these aquifers. The few on-stream lakes (lakes that are directly on a stream tributary to the Tanana River, or on the Tanana River itself) present in the Tanana River system do not provide sufficient storage to sustain stream flow during winter or through dry summers (Selkregg 1976). Most precipitation during the winter is retained in the snow-pack and further restricts winter flows. Glaciers provide some storage of water that can enhance stream flows in dry summers (Selkregg 1976).

Lake development in the Tanana basin is not as extensive as in many other parts of Alaska. Some 20 lakes within the drainage exceed 26 km² in surface area. Most of the water bodies within the system do not contain sufficient volume to influence Tanana River flows, but many are important for sport fishing because of wild or stocked species residing in the lakes. Primary lakes for sport fishing within the Tanana River drainage are Birch, Chena, Fielding, George, Harding, Quartz, Tangle, and Volkmar lakes (Figures 3 and 4). Volkmar and George lakes do not have roadside access. Chena Lake (Figure 2) in the lower Chena River basin is man-made, resulting from gravel removal to erect flood control structures during the 1970's. Many of the waters listed are shown in Figures 3 and 4, and the lakes of the upper Delta River are shown in Figure 5.

Lakes are generally covered with ice by late October and breakup can occur as late as late June or early July. Typically, ice can range from 80 to 100 cm thick on interior Alaska lakes.

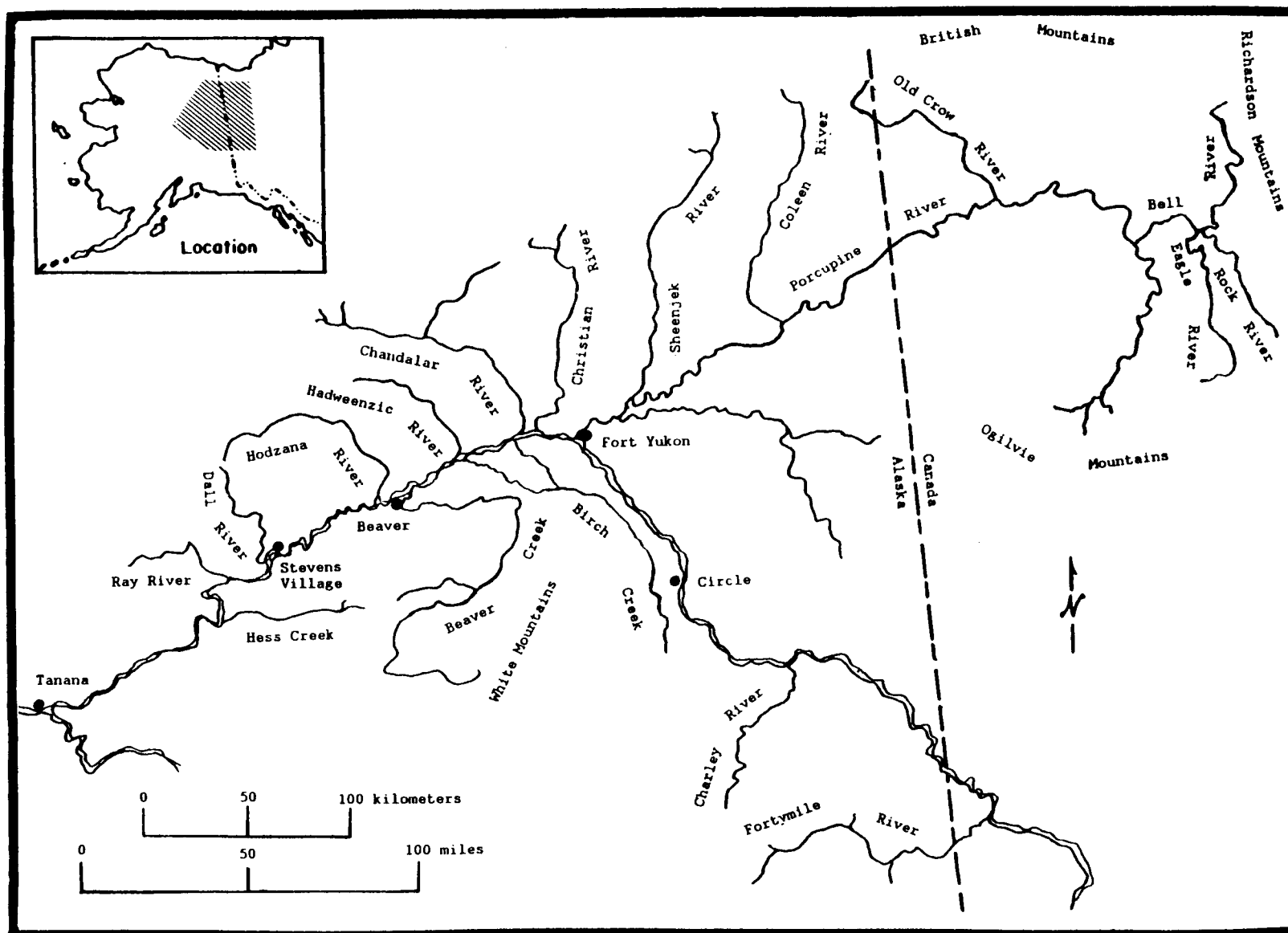


Figure 7. Middle Yukon River and Porcupine River drainages.

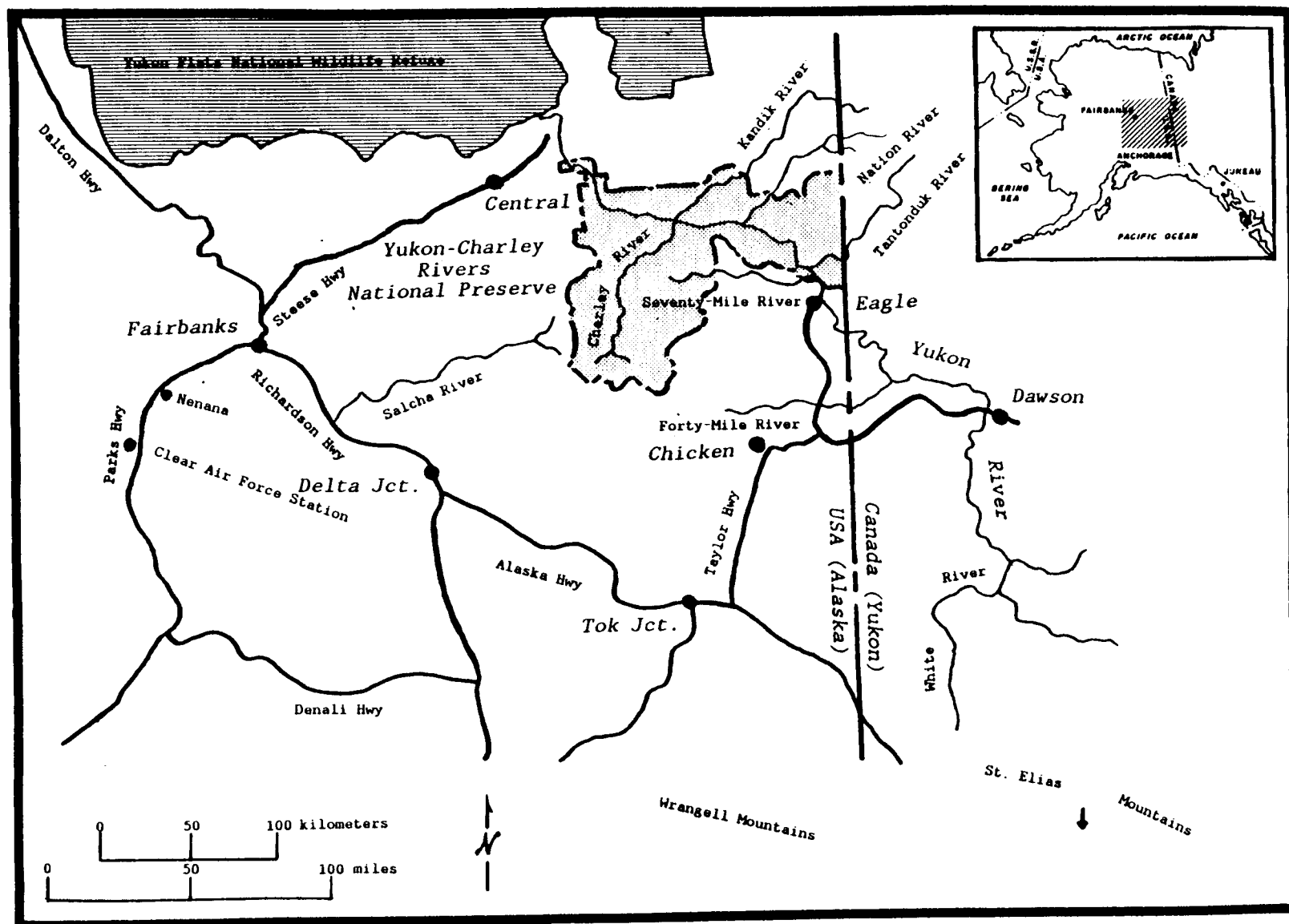


Figure 8. Major highways in interior Alaska.

Lake formation has occurred by several means. In some cases, (eg. Harding, Healy, George lakes) lakes are created by silt from the Tanana River damming streams draining the surrounding hills. Buried ice masses can melt, resulting in lake formation in the sub-glacial soil. Lakes also form when permafrost melts due to vegetative disturbance. Vegetation insulates permafrost soils, and melting can occur when it is removed (Selkregg 1976).

Climate

Climate in the area is one of harsh contrasts, with spring coming as early as mid-April and snowfall, with subfreezing temperatures, occurring as late as June. Summers are three months in duration and are characterized by long daylight hours and temperatures occasionally exceeding 32°C. The fall season may extend through early October, with snowfall and decreasing temperatures. Winter lasts from mid-November until mid-March, and during this time temperatures may fall to -57°C. Annual precipitation averages around 28 cm, with most falling between June and September (USDA 1986).

Primary Species for Sport Fishing

There are 17 fish species known to occur in the Tanana area of which ten are important sport species. They include: chinook salmon *Onchorhynchus tshawytscha*, coho salmon *Onchorhynchus kisutch*, Arctic grayling *Thymallus arcticus*, burbot *Lota lota*, lake trout *Salvelinus namaycush*, inconnu (sheefish) *Stenodus leucichthys*, least cisco *Coregonus sardinella*, humpback whitefish *Coregonus pidscian*, northern pike *Esox lucius*, and rainbow trout *Onchorhynchus mykiss*.

Status and Harvest Trends of Wild Stocks

A brief description of the fisheries for the most prominent sport species in the Tanana Area follows.

Chinook Salmon:

Chinook salmon fisheries for the most part occur in the lower sections of the Salcha and Chena rivers and to some extent along the upper Chatanika River, since these are essentially the only road-accessible tributary stocks available in sufficient abundance to support recreational harvests. Sport harvests in the Salcha River since 1980 have ranged between 150 and 900 chinook salmon, while harvests from the Chena and Chatanika rivers are small but growing. Angler awareness and salmon return abundance both seem to be increasing. The estimated sport harvest of chinook salmon from the Salcha and Chena rivers in 1987 was 244 and 195, respectively (Table 1).

Coho Salmon:

Coho salmon are taken in the Delta Clearwater River and from various creeks in the Nenana River drainage. Coho salmon occur in other tributaries to the Tanana River but little sport fishing effort has occurred. The Kantishna and Toklat river tributaries such as Moose, Barton, and Geiger creeks, and the

Table 1. Tanana Area^a sport fish harvest and effort by fisheries and species^b 1987^c.

	Anglers	Trips	Days Fished	KS	SS	LL	CS	LT	DV AC	RT	GR	WF	SF	NP	BB
Upper Chena River ^d	7,113	10,188	10,667	0	0	0	0	0	0	0	1,451	8	0	20	40
Lower Chena River ^e	6,472	12,281	12,605	195	0	0	49	0	0	0	1,230	48	36	96	109
Badger Slough ^f	876	2,062	1,793	0	0	0	0	0	0	0	409	0	18	53	0
Piledriver Slough	4,686	15,236	13,257	0	0	0	49	0	0	4,346	4,907	53	36	106	79
Nenana River Drainage	674	893	1,575	7	0	0	0	0	0	0	409	317	0	13	53
Chatanika River	7,484	11,481	11,065	21	0	0	0	0	0	0	5,619	25,074	91	554	13
Salcha River	5,731	9,080	10,576	244	0	0	132	0	0	0	4,762	277	0	13	0
Delta Clearwater River	3,068	4,679	5,397	0	1,068	0	42	0	0	0	2,005	66	0	53	26
Goodpaster River	742	1,508	3,061	0	0	0	0	0	0	0	1,702	0	0	0	13
Shaw Creek	607	1,170	797	0	0	0	0	0	0	0	567	0	0	40	607
Brushkana Creek	674	708	674	0	0	0	0	0	0	0	594	0	0	0	0
Tanana River	3,371	5,386	5,940	0	0	0	348	0	0	0	1,438	210	54	225	2,362
Other Streams	5,192	5,789	7,556	7	163	0	0	54	36	0	4,656	39	0	489	355
Birch Lake	7,821	14,128	15,375	0	0	6,719	0	0	0	9,981	0	0	0	0	0
Quartz Lake	11,832	19,730	20,410	0	0	15,449	0	0	0	10,106	0	0	0	0	0
George Lake	1,247	831	1,467	0	0	0	0	0	0	0	0	0	0	2,229	0
Fielding Lake	742	646	1,032	0	0	0	0	127	0	0	910	79	0	0	13
Minto Flats	1,483	1,262	1,539	0	0	0	0	0	0	0	0	0	0	1,161	132
Tangle Lakes	2,460	1,816	2,530	0	0	0	0	0	0	0	2,467	132	0	0	0
Chena Lake (Lake only)	4,888	9,142	9,472	0	0	1,398	0	0	0	5,220	0	0	0	0	0
Harding Lake	3,371	4,032	5,125	0	0	0	0	0	0	118	79	0	0	1,886	53
Other Lakes	7,320	10,068	14,148	28	0	3,000	0	471	0	2,053	5,275	132	0	2,533	0
TOTAL	35,834 ^g	142,116	156,061	502	1,231	26,566	620	652	36	31,824	38,480	26,435	235	9,471	3,855

^a Tanana River Drainage (Area U): All southern drainages of the Yukon River from its confluence with the Tanana River, near Tanana, to the Canadian border; including the entire Tanana River drainage, and the Alaskan portion of the White River drainage.

^b KS: chinook salmon; SS: coho salmon; LL: landlocked coho or chinook salmon; CS: chum salmon; LT: lake trout; DV/AC: Dolly Varden or Arctic char; RT: rainbow trout; GR: Arctic grayling; WF: whitefish; SF: sheefish; NP: northern pike; BB: burbot

^c From Mills 1988.

^d The Chena River and tributaries accessed from the Chena Hot Springs Road beyond 25 Mile on the road.

^e The Chena River and tributaries from the mouth upstream to 25 Mile Chena Hot Springs Road.

^f All parts of Badger Slough (sometimes called Chena Slough).

^g Angler totals may not equal sum of sites due to some anglers fishing at more than one site.

Sushana River (Figure 2), where artesian waters are found, support coho salmon populations. The largest Tanana drainage harvest occurred in 1986 when an estimated 1,374 coho salmon were taken (Mills 1987). The vast majority of the harvest in the Tanana River drainage is taken from the Delta Clearwater River where 1,068 coho salmon were estimated to have been taken in 1987 (Table 1).

Arctic Grayling:

Arctic grayling are perhaps the most ubiquitous and frequently sought-after sport species in the Tanana area. The species inhabits most of the flowing waters and many of the lakes of the drainage and is favored by anglers because of its trout-like characteristics. Essentially all the major clear water tributaries to the Tanana River support Arctic grayling populations. The major Arctic grayling fisheries in the Tanana drainage occur in the Chena, Salcha, Chatanika, and Goodpaster rivers; Badger and Piledriver sloughs; Shaw Creek; the Delta and Richardson Clearwater rivers; and Fielding and Tangle lakes. From an historical perspective, the Chena River has supported the largest Arctic grayling fishery in the state, due to its proximity to Fairbanks and many miles of road access. The Tangle Lakes support the largest lacustrine fishery for Arctic grayling in Alaska.

The average annual harvest of Arctic grayling in the Chena River, exceeded 21,000 fish from 1977 to 1984. The harvest declined from a peak of 42,000 in 1980 to a low of about 8,000 in 1985 and 1986, while effort has remained relatively stable (Clark 1987a). In 1987, the estimated sport harvest of Arctic grayling in the Chena River was 3,090 (Mills 1988). Declines in important Tanana River drainage Arctic grayling fisheries have been noted in recent years and Shaw Creek, the Delta Clearwater River, Richardson Clearwater River and Chena River fisheries are examples of depleted stocks. In 1975, because of perceived increases in fishing effort with the construction of the trans-Alaska pipeline, the daily bag limit in the Tanana drainage was decreased from 10 to five Arctic grayling. The possession limit has been maintained at 10 Arctic grayling since 1962. The reduction in bag limit in 1975 to five fish daily and 10 in possession did not prevent the decline of important Arctic grayling stocks nor did it increase or stabilize fishing success. Declines in fishing success have been attributed to reductions in Arctic grayling abundance due to both reduced recruitment because of unfavorable environmental conditions (primarily high river discharge during the natal year) and to sport fishing overharvest of already declining stocks (Clark 1987a).

The Department identified conservation problems with some of the Arctic grayling populations in the Tanana drainage in 1986 and prepared regulatory proposals designed to prevent further declines in stock abundance. The Alaska Board of Fisheries did not meet in 1986, and the proposals were consequently implemented in 1987 by enacting emergency regulations. The emergency regulations were made permanent by Board action at the December 1987 meeting. A more complete summary of these and other regulatory actions that occurred in 1987, appear in this report under the section titled "Management Activities".

Northern Pike:

Northern pike are harvested by sport fishermen using hook and line gear in summer and winter as well as with spears during the winter. The majority of the Tanana Area harvest takes place in lakes which are easily accessed. Important fishing areas are found in Minto Flats, northwest of Fairbanks (Figure 2) and in George and Volkmar lakes southeast of Delta Junction (Figure 3). Minto Flats and George Lake support the largest recreational northern pike fisheries in Alaska.

In 1987, the sport harvest of northern pike in Minto Flats and George Lake was 1,161 and 2,229 respectively, accounting for more than 35% of the harvest of 9,471 northern pike in the Tanana River drainage (Mills 1988).

Additional lakes and streams where northern pike are harvested by sport anglers include East and West Twin lakes and Wien Lake in the Kantishna River drainage, Fish Lake near the Tanana-Yukon confluence, Wellesley, Dog, Jatahmund, Island, and Deadman lakes, and Moose and Scotty creeks in the vicinity of Northway (Figures 2 and 6).

Harvest and effort have increased for northern pike in the past ten years. Angler surveys indicate that this species is the second most sought-after indigenous sport fish species in the Tanana Area. It is estimated that more than 20,000 anglers fished for northern pike during 1986 (Holmes and Pearse 1987). The total sport harvest of northern pike within the Tanana River drainage has remained relatively stable over the past ten years, from 8,000 to 12,000 fish annually. Because of the substantial increase in effort, however, the catch per angler day has decreased.

Recent studies of northern pike populations within the Tanana River drainage have estimated that some exploitation rates are higher than sustainable. Even in populations where exploitation rates are not judged to be excessive (less than 20% per year) as in Volkmar Lake, the number of large fish has declined rapidly under only modest harvest pressure. The population residing in the Minto Flats area has been of special concern due to high additive estimated rates of exploitation in summer and winter subsistence and sport fisheries. Concern over increased harvest in the Minto Flats (Tolovana River drainage) prompted the Department of Fish and Game to close the winter sport fishery on February 6, 1987, by emergency order. This closure was made permanent, as was a reduction in the bag and possession limit for northern pike in the Tanana River drainage by the Board of Fisheries in December, 1987.

Lake Trout:

Lake trout are found in many of the lakes and a number of the streams of the Delta and Upper Tanana River drainages (Burr 1987). They are most frequently associated with deep, oligotrophic lakes in the mountains and are rarely found at lower elevations of the Tanana River drainage. Lakes of the Delta River drainage (Figure 5) including Fielding, Landmark Gap, Sevenmile, and the Tangle lakes contain significant populations of this species. Harding Lake (Figure 4) near Fairbanks contains a small population of transplanted lake trout. On average, 65% of the AYK Region lake trout harvest is taken from

lakes in the Tanana drainage. The regional lake trout harvest increased at an annual average rate of 25% per year from 1978 to 1985. An apparent major decline in abundance was first observed in 1986, especially in waters of the Tanana drainage. Research on the species in both southcentral and interior Alaska indicates that most of the road accessible stocks have undergone overexploitation in recent years.

Lake trout are a long lived, slow growing and late maturing species, and the potential impact of even a modest fishery can be significant. Lake trout older than 25 years are not uncommon, and individuals older than 50 years are recorded for Alaska (Burr 1987). Trophy lake trout weighing 8.7 kg (20 lbs) or more are typically 20 or more years old (Burr 1987). Tanana drainage lake trout harvests peaked at about 3,100 in 1982. The estimated 1987 harvest was 652 fish (Table 1). The Department enacted a series of new fishing rules by issuing emergency regulations for the 1987 fishing season in an attempt to prevent further declines in lake trout abundance. The regulations reduced the bag and possession limit, and adopted a minimum size for lake trout in the Tanana River drainage.

Burbot:

Burbot are a popular Alaskan sport fish. The majority of the AYK Region harvest occurs in waters of the Tanana Area. Participation is mostly by local residents using set lines (hook and line gear set on the bottom, left unattended for up to 24 hours, using hooks with a minimum gap of 19 mm from barb to shank) although hand-held fishing gear is also used. Most fishing occurs during the winter months. Burbot fishing occurs in streams, primarily the Tanana River, and in lakes. The most heavily fished lakes are Fielding and Harding lakes. The estimated 1987 burbot harvest for the Tanana drainage is 3,855 fish (Table 1). The Tanana River supports one of the largest burbot fisheries in the state, surpassed only by the burbot fisheries in and around the Glennallen area. Although Tanana River burbot harvest rates are not currently excessive, studies of harvest rates and abundance in Tanana drainage lakes suggest that high exploitation rates in previous years has been followed by present low stock abundance in most of the lakes studied to date.

To prevent further declines in lake burbot populations of the Tanana drainage, the Department implemented emergency regulations in 1987 to prohibit the use of set lines in lakes from May 15 to October 15, and reduce the bag and possession limit in all Tanana drainage lakes to five fish. Also, a ban on the use of set lines throughout the entire year was enacted for Harding, Fielding, T, and Tangle lakes along with a further reduction in the bag and possession limit to two burbot from these same waters.

Whitefish:

The majority (60%) of the statewide whitefish harvest occurs in the AYK Region. The sport harvest of whitefish is almost entirely from the Chatanika River, tributary to the Tanana River, where an active and growing spear fishery occurs in the fall. In 1986, nearly 27,000 whitefish were harvested in the Tanana Area, more than 19,000 of which were taken through the fall spear fishery in the Chatanika River. Species composition of the harvest from

the spear fishery was approximately 13% humpback whitefish, and 87% least cisco. In 1987, the total harvest of whitefish in the Tanana River drainage was estimated to be 26,435 fish (Table 1), with more than 25,000 taken from the Chatanika River (Mills 1988). Species composition in 1987 was similar to that documented in 1986 (least cisco 86%; humpback whitefish 14%).

The Chatanika River supports a large spawning population of both humpback whitefish and least cisco. During late summer and fall, these fish migrate up the river from Minto Flats to spawn. By the time of freeze-up, approximately mid-October, the adult whitefish have departed for wintering areas that have not been identified, possibly outside the Chatanika River. It is not known whether the Chatanika River provides habitat for whitefish other than during spawning and the egg-fry development stages.

Harvest levels have increased steadily since 1981 when the total estimated harvest was approximately 5,000 whitefish. Since 1977, harvest of whitefish from the Chatanika River has increased at an average annual rate of about 35%, making it the fastest growing recreational fishery in the Tanana River drainage (Hallberg and Holmes 1987). Approximately 3,849 angler-hours of effort were expended in 1987. The peak period from 25 September until 4 October accounted for more than 90% of the harvest (Baker 1988). Exploitation rates for least cisco and humpback whitefish in 1987 were 40% for least cisco and 15% for humpback whitefish. Prior to 1987 no bag or possession limits were in effect for whitefish in the AYK Region. In December, 1987, the Board of Fisheries enacted a 15 whitefish bag and possession limit for the waters of the Tanana River drainage. It was hoped that the new regulations would have the effect of not only reducing harvest but also that exploitation rates would be limited to no more than 20%, a level thought to be sustainable for these species of whitefish.

Sheefish:

Spawning stocks of sheefish in the Tanana River drainage have only been documented in the upper Chatanika River, (Alt 1987a.) Tagging studies conducted between 1967 and 1971 indicated that sheefish that spawned in the Chatanika River were the same fish that spent the summer feeding in Minto Flats (Alt 1987a). Sheefish tagged in the Chatanika River were recovered in the lower Chena River and at Nenana, indicating widespread movement of sheefish after spawning. Sheefish are widely distributed in the Tanana River drainage during the open water season, from the Tanana River mouth to more than 300 km upstream of Fairbanks. They have been found at the mouths of the Bearpaw and Toklat rivers in the Kantishna River drainage (Alt 1987a). Typically sheefish are taken in the lower reaches of clear water tributaries such as the Chena, Chatanika, Tolovana, and Tatalina rivers as well as others. Total estimated sport harvest of sheefish in the Tanana River drainage in 1987 was 235 fish (Table 1).

Rainbow Trout:

Rainbow trout are not indigenous to the Yukon River. Since the 1950's, rainbow trout have been planted into about 75 Tanana Area lakes. There is no evidence that natural reproduction has taken place.

A total of 1,815,553 rainbow trout was planted in 42 lakes of the Tanana Valley in 1987, all from brood stock originating from the Swanson River (Kenai Peninsula). These fish were reared to the fingerling stage or larger in the Clear Hatchery near Nenana, or in the Fort Richardson Hatchery near Anchorage.

A total of 60,000 rainbow trout were stocked into Piledriver Slough, formerly a slough of the Tanana River located about 32 km (20 mi) south of Fairbanks (Figure 2). The waters of the slough became clear when the Army Corps of Engineers blocked Tanana River water from entering the upper end in 1976. The blocking of the slough was done in conjunction with the Army Corps of Engineers Chena River Lakes Flood Control Project, and was designed to prevent high water discharge from the Tanana River from spilling into the designated flood-way. Piledriver Slough which now is fed by groundwater from the Tanana River valley, reestablished itself as a clearwater tributary to Moose Creek which discharges directly into the Tanana River. Arctic grayling, whitefish and long-nosed suckers *Catostomus catostomus*, were found inhabiting Piledriver Slough within a year after its upper end was blocked. Piledriver Slough was first stocked in 1987 with 35,000 fingerling, 12,500 subcatchable, and 12,500 catchable size rainbow trout. The objective of stocking was to create a stream rainbow trout fishery in Alaska's interior, thus providing more diversity for anglers.

The harvest of rainbow trout in Piledriver slough by sport anglers in 1987 was estimated to be 4,346, while 27,478 rainbow trout were taken in lakes of the Tanana Area (Table 1).

ARCTIC, YUKON, AND KUSKOKWIM AREA DESCRIPTION

Excluding the Tanana River drainage which comprises a little over 10% of the land area of the AYK Region, the AYK Area consists of some 870,000 km² of extremely varied topography, climate, and zoogeography. Land ownership and jurisdictions fragment this huge area into a mosaic of patterns, some of which overlap. The federal government is the major land manager through its jurisdiction over the land withdrawals for National Parks and Preserves, National Wildlife Refuges, and Wild and Scenic Rivers. Native corporations, State of Alaska and private lands comprise the rest. The State of Alaska, by virtue of the Statehood Act retains authority to manage fisheries and wildlife on all lands and waters of the state. For purposes of reporting and organizing statistics in the statewide harvest survey, the area is subdivided into five sub-areas; Lower Yukon-Kuskokwim, Seward Peninsula-Norton Sound, Northwest Alaska, south slope of the Brooks Range, and north slope of the Brooks Range.

Geographic and Geologic Setting

Dominant features of the huge landmass that lies north of the Alaska Range divide include the Alaska Range itself which provides water for streams in the Kuskokwim drainage and to the Tanana River and its tributaries. The Brooks Range and its drainages provide water to the Noatak, Kobuk, Colville, Koyukuk,

and Porcupine rivers as well as to many other streams that drain directly into the Yukon River or the Arctic Ocean and the Chukchi Sea.

The Yukon is the largest river in Alaska and its drainage constitutes the fifth largest in North America. The river originates in the basin and range domain of the southern Yukon Territories and northern British Columbia, and flows over 3,700 km northwest to its mouth on the Bering Sea coast. Additional Canadian flows to the upper Yukon River watershed are added from glacial streams such as the White River which originates in the Wrangell and St. Elias Mountain ranges. Approximately one-third of the Yukon River watershed is in Canada. The total drainage area of the Yukon River is approximately 855,000 km², including the area in Canada. Approximately three-fourths of the land area of the AYK Region is encompassed in the Yukon River drainage. The entire main stem of the Yukon River up to the confluence of the White River (Figure 8) in Canada is turbid from glacial silt entrained in the waters draining the Alaska, St. Elias, and Wrangell Mountain ranges.

Lake and Stream Development

Sport fishing waters and opportunities are extremely varied as could be expected in an area so large and diverse. In the following section the primary fishing waters and species of interest will be briefly characterized for each of the five sub-areas within the AYK Area. Not all streams, lakes, or fish stocks of importance receive attention in this cursory treatment. It must be noted that the Yukon River drainage is divided into three sub-area(s) (Tanana, Lower Yukon-Kuskokwim, and South Slope Brooks Range) for purposes of the statewide harvest survey report, with distinctions between sub-areas based only on whether the drainage in question lies on the north or south side of the Yukon River. The following descriptions may therefore seem confusing at times because of the necessity to describe parts of the drainage according to location by sub-area.

Lower Yukon-Kuskokwim River Sub-area:

The Lower Yukon-Kuskokwim sub-area (statewide harvest Area V; Figure 1) includes all southern drainages of the Yukon River from its confluence with the Tanana River, near Tanana, west to Kaltag; all north and south drainages of the Yukon River south of Kaltag to the Bering Sea; the Kuskokwim River watershed; all waters flowing into Kuskokwim Bay; and adjacent salt water and islands. The sub-area has also been referred to as the Interior sub-area in some reports. This sub-area does not include the Pastolik River drainage and waters flowing into Norton Sound northeast of the Pastolik River nor any portion of the Tanana River watershed¹. The Lower Yukon-Kuskokwim sub-area excludes the Koyukuk and Porcupine River drainages because they drain the south slope of the Brooks Range. It should also be noted that prior to 1984 the boundaries of the sub-area were such that the Arctic Circle was utilized as a northern limit. Now the northern limit of the Lower Yukon-Kuskokwim sub-

¹ The Sport Fish Division assigns management responsibility for Kuskokwim Bay and Kuskokwim River waters upstream to Aniak to its Southcentral Region headquartered in Anchorage. Responsibility for these areas is assigned to Sport Fisheries staff stationed in Dillingham.

area extends from Kaltag along the Yukon River to the confluence with the Tanana River (Mills 1985).

The primary flowing waters of the sub-area are the main stems of the Yukon and Kuskokwim rivers and their tributaries according to the sub-area definition. The Holitna River is the most productive stream for sport fishing in the Kuskokwim River drainage (Figure 9) above the Aniak River confluence, because of the diversity and abundance of its resident and anadromous species. Approximately six fishing guides provide services on the river to about 75 clients per year (Rue et al. 1987). No permanent lodge or tourist structures are present on the river. The Holitna River supports populations of Arctic char *Salvelinus alpinus*, Dolly Varden *Salvelinus malma*, Arctic grayling, northern pike, burbot, sheefish, whitefish and all five pacific salmon species. Rainbow trout are not documented in the Kuskokwim River drainage upstream of the Aniak River. Dolly Varden, coho salmon, and chinook salmon are the primary sport fish species in the Holitna River, although feeding sheefish are present in the summer as far upstream as the Hoholitna River (Alt 1987a) and are sought by many anglers. The Stony, Swift, Gagayah, Tatlawiksuk, Cheeneetnuk, and Hoholitna rivers are some of the other important middle Kuskokwim River tributaries. All originate in the Alaska Range and its foothills (Figure 9). Fishery resources of these streams are incompletely documented, and because of remoteness and limited access, they are thought to receive only light recreational use from sport anglers.

Above McGrath, (Figure 10) in the upper Kuskokwim River drainage, there are many tributaries that originate in the Alaska Range, such as the Big River, the Middle, South, Windy, Big Salmon, Slow, and East forks of the Kuskokwim River, as well as the Tonsona and Little Tonsona rivers and Highpower Creek near Telida. The North Fork, Nixon Fork, and Takotna rivers originate in the Kuskokwim Mountains west of the Kuskokwim River. Chinook, coho, and chum salmon *Oncorhynchus keta* spawn in streams of the upper Kuskokwim River drainage, as do sheefish. Sheefish spawning has been documented in Big River and in Highpower Creek (Alt 1987a). Although most of the primary sport fish species occur in the middle and upper Kuskokwim River drainage, (with the exception of rainbow trout), sport fishing effort is extremely light on most streams and fish stocks. Most fisheries exploitation in the middle and upper part of the drainage occurs in local subsistence fisheries that primarily target salmon and whitefish.

Lake development in the Kuskokwim River drainage above the Aniak River is sparse, and there are few lakes with high potential for recreational fisheries. The fisheries resources in two lakes (Telequana and Two; Figure 9) in the upper Stony River were surveyed by Russell (1980), and Whitefish Lake in the upper Hoholitna River was surveyed in 1977 by Baxter (1977). Lake trout occur in all three lakes, as do Arctic grayling, northern pike, and various whitefish species. Dolly Varden were noted in Two and Telequana lakes but not in Whitefish Lake. Recreational angling occurs in Telequana and Two lakes, both by guided and unguided fishermen. Little information is available regarding sport fishing opportunities and species available in other lakes of the drainage. Most of the lakes in the upper drainage are shallow tundra lakes, unsuitable for supporting year-round resident fish populations. Big

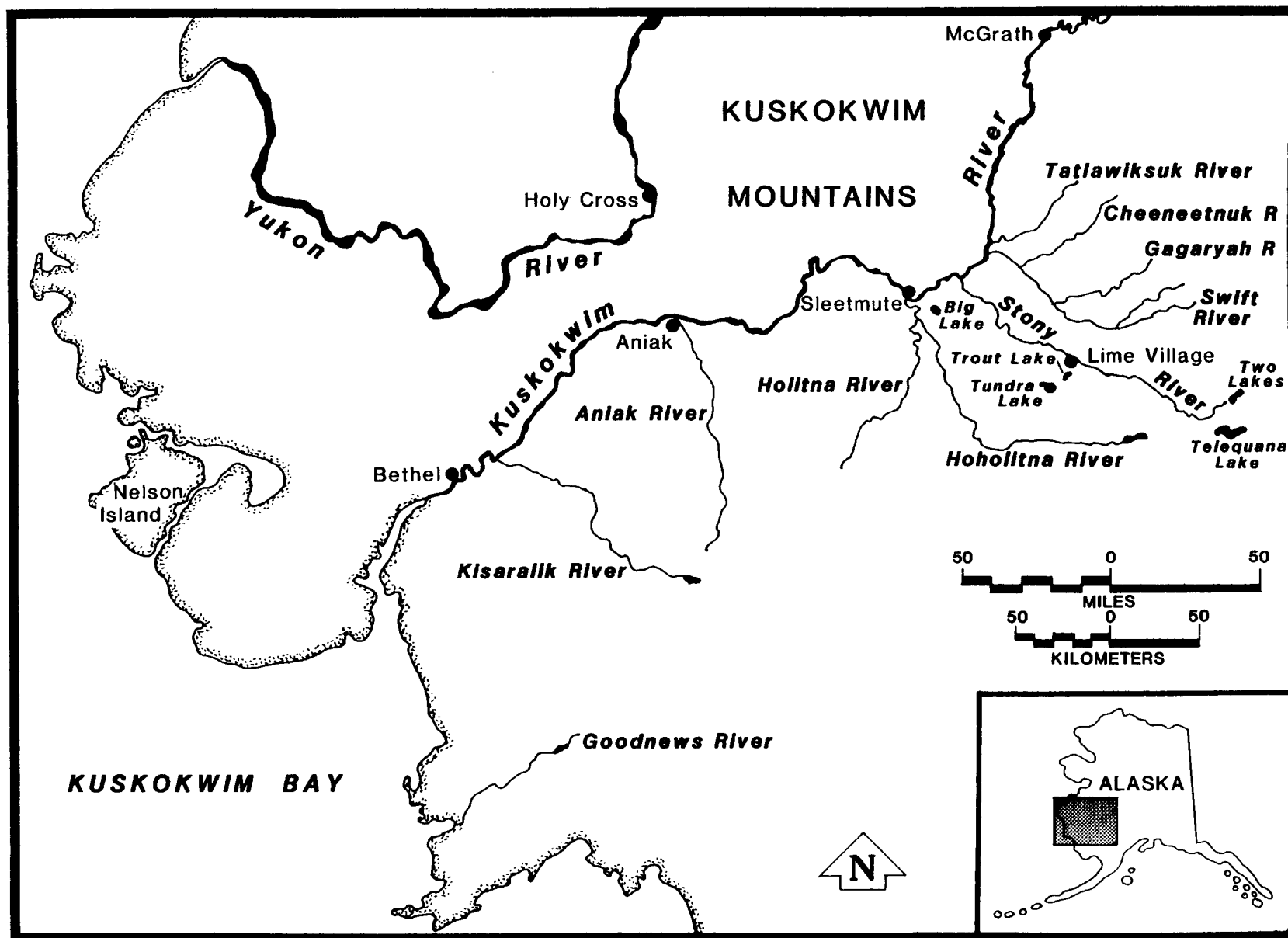


Figure 9. Waters of the lower Kuskokwim River valley.

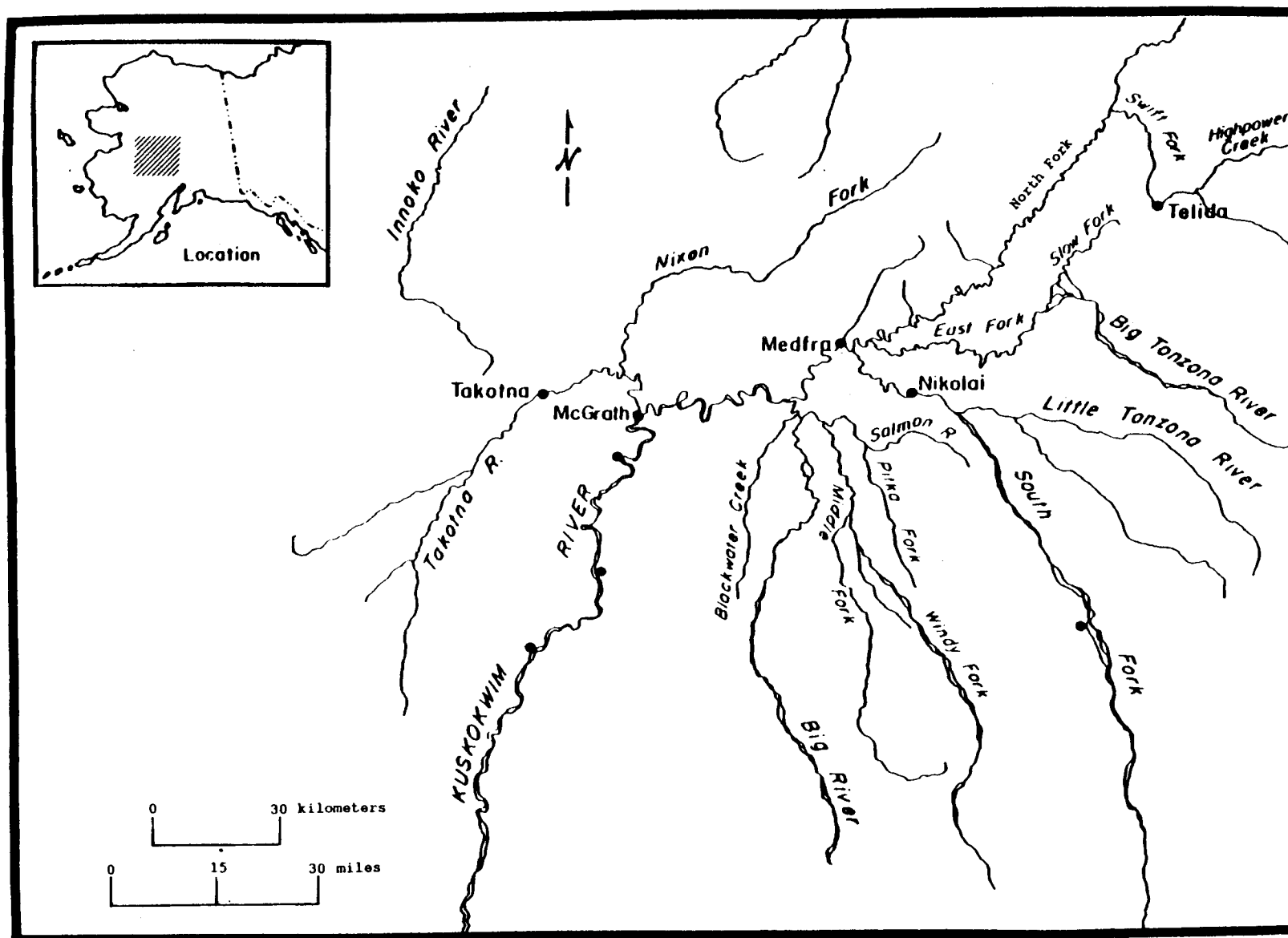


Figure 10. Waters of the upper Kuskokwim River valley.

Lake near Sleetmute, and Tundra and Trout lakes near Lime Village on the Stony River support year-round fisheries because of their size.

Clear water streams with sport fishing potential that are part of the Yukon River drainage are extremely numerous and extend to third and fourth order tributaries. Although the main stem of the river flows for approximately 3,200 km, (with the upper third in Canada) this report will include only Alaskan waters. Beginning near the Yukon mouth, (Figure 11) the east and west forks of the Andreafsky River are both high quality sport fishing streams and have been designated as Wild and Scenic Rivers (Wild and Scenic Rivers Act 1968). All the Pacific salmon species, with the exception of sockeye salmon *Oncorhynchus nerka*, occur in the rivers as do Arctic grayling, Dolly Varden, and northern pike (in sloughs and lakes off the rivers). Each fork of this river is in itself a major stream and each drains extensive remote areas of the Nulato Hills between the Yukon River Delta and Norton Sound.

The lower Yukon River provides a migratory corridor for all the species of resident, anadromous, and estuarine-anadromous fishes of the drainage. In addition, many species, such as sheefish, northern pike, several whitefish species, burbot and suckers utilize the main stem lower river for rearing and feeding, particularly in winter months. For some species such as burbot, the main stem provides year-round habitat.

The Innoko River and its tributaries drain a large area of flat wetlands and foothills of the Kuskokwim Mountains. The confluence of the Innoko River with the Yukon River is near the village of Holy Cross. The Innoko River system contains numerous northern pike as well as other species. A vestigial sockeye salmon stock spawns in the system, in addition to chum, chinook and coho salmon, but there is no evidence that the Innoko River is important for salmon production when compared to other known productive streams in the Yukon River drainage.

The Anvik River enters the Yukon River at the village of Anvik about 515 km upstream from the mouth, and is a highly productive stream. The river courses eastward from its drainage area in the Nulato Hills for about 130 km and although it is primarily a rapid runoff stream, a substantial amount of artesian upwelling helps stabilize winter flows and water temperatures. Besides supporting the largest chum salmon spawning stock in the Yukon River drainage, with over a million individuals spawning in some years, (Whitmore et. al. 1987) the stream supports large numbers of chinook and coho salmon, Arctic grayling, Dolly Varden, and northern pike. Fishing quality is excellent, but few anglers use the stream during the summer season because the stream is so remote and difficult to access.

The Kaltag and Rodo river mouths, and Bishop Creek mouth support fisheries for sheefish and Arctic grayling during summer and early fall. Sport fishing for northern pike is common in sloughs and lakes near the main stems of the Yukon and Koyukuk rivers as well as in the extensive Kaiyuh Flats southeast of Galena.

The Nowitna River, whose confluence with the Yukon River is upstream from Ruby, is a major clear water tributary which enters the Yukon from the south

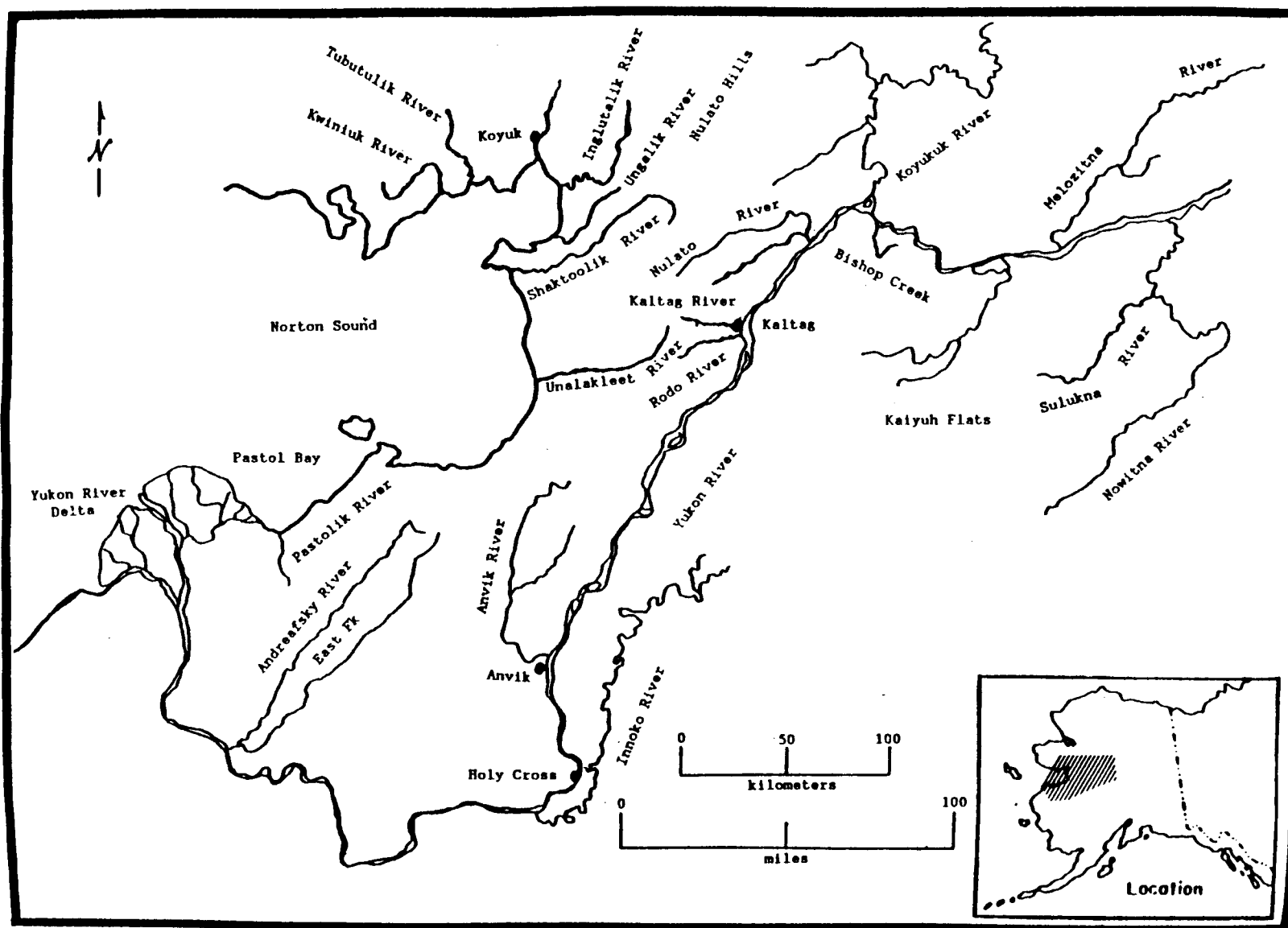


Figure 11. Lower Yukon River and eastern Norton Sound drainages.

and drains the north slope of the Kuskokwim Mountains. It was designated as a Wild and Scenic River in 1980 (Alaska National Interest Lands Conservation Act, P.L. 96-487) and supports a significant amount of recreational fishing, much of it originating from urban centers. Good angling for sheefish, northern pike and Arctic grayling can be found in the drainage, which consists of several branches. Most of the main stem and major tributaries are included in the Nowitna National Wildlife Refuge (USFWS 1987b). The river supports a population of spawning sheefish in its Sulukna River tributary (Alt 1987a).

Few large deep lakes sufficient to moderate flows or water temperatures are present in the Upper Kuskokwim River drainage and the Alaska Yukon River drainage. The majority of the lakes in the Yukon drainage developed as a result of thawing action on saturated permafrost soils and as a result, the lakes are mostly shallow and they are not supportive of primary sport species such as lake trout. There are thousands of such lakes in the deltas and flats of the drainage. Many of them provide summer feeding and rearing areas for various whitefish species, as well as for northern pike and occasionally, sheefish. Those fish utilizing the shallow thaw lakes for summer feeding habitat generally depart these lakes and move into primary tributaries and main stems of the major rivers prior to freeze-up in the fall.

Seward Peninsula-Norton Sound Sub-area:

The Seward Peninsula-Norton Sound sub-area (statewide harvest Area W; Figure 1) includes all waters north of the Yukon River drainage and south of the Selawik River-Kotzebue Sound area and west of the Yukon-Koyukuk River drainages. This area includes Pastol Bay and all salt water north and west of it in Norton Sound as well as salt water adjacent to the Seward Peninsula, including Spafarief Bay in Kotzebue Sound and the southern half of Eschscholtz Bay (ADFG 1984).

Primary sport fishing streams in eastern Norton Sound (Figure 11) include several that drain the Nulato Hills which separate Norton Sound from the Yukon and Koyukuk River valleys. They include the Unalakleet, Shaktoolik, Inglutalik, and Ungalik rivers. The Unalakleet River is the largest and most heavily utilized of these, and it supports a substantial amount of sport fishing activity during summer months. A permanent lodge and guide service is established on the lower Unalakleet River. The river and its tributaries support populations of Arctic grayling and Dolly Varden as well as chinook and coho salmon. The other area streams also support those species, but are not as intensively fished, primarily because of the limited access and the lack of facilities available to nonlocal fishermen. The Koyuk River empties into Norton Bay in the extreme eastern corner of Norton Sound. Near its mouth it is a fairly large, low gradient, muddy stream. It offers little potential for sport fishing except for northern pike and Arctic grayling in some of the clear water tributaries.

Several high quality sport fishing streams are located along the southern half of the Seward Peninsula from Koyuk to Teller, (Figure 12) including the Tubutulik, Kwiniuk, Fish, Niukluk, Bonanza, Eldorado, Nome, Snake, Sinuk, Pilgrim, Agiapuk, and Kuzitrin rivers. Road access from Nome exists to all except the Kwiniuk and Tubutulik rivers, and all the streams are clear and

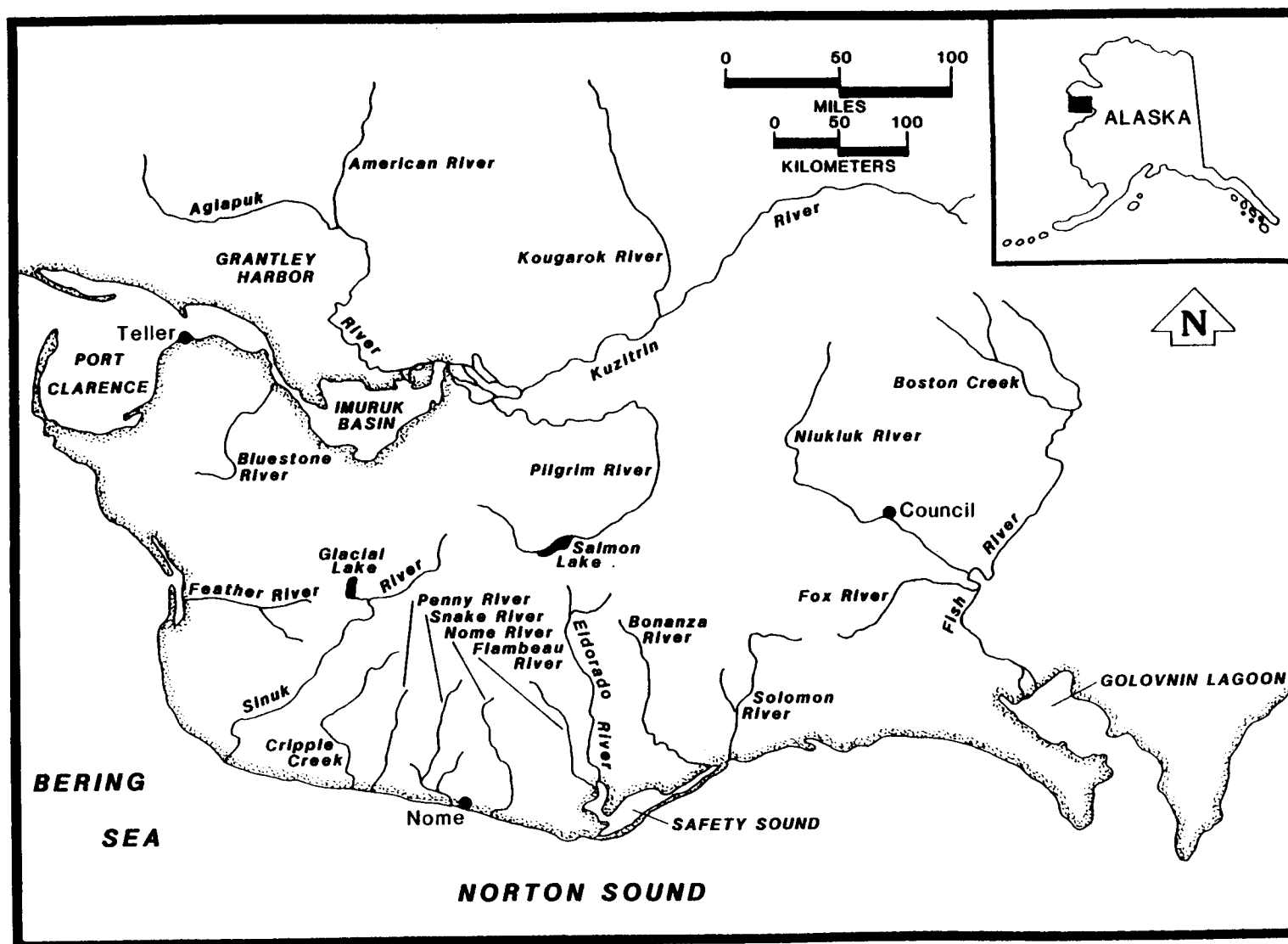


Figure 12. Waters of the Seward Peninsula.

swift flowing for most of their watercourses. Arctic grayling, Dolly Varden, and coho salmon are all present in these streams, and many contain chinook salmon, pink salmon *Oncorhynchus gorbuscha*, chum salmon, or northern pike. Small, perhaps remnant, sockeye salmon stocks are also present in the Pilgrim and Sinuk rivers. Trophy Arctic grayling (larger than 1.4 kg or 3 lbs) are present in many streams on the Seward Peninsula, including the Sinuk, Tubutulik, Fish, and Kuzitrin rivers as well as others.

Streams draining the northern half of the Seward Peninsula are not noted for their sport fishing potential due to relatively small flow volumes, difficult access, and poorer quality fisheries habitat.

Lake development on the Seward Peninsula consists of typical thaw lakes in the river floodplains and glacially created lakes in the mountains of the central and western portion of the Seward Peninsula. The largest inland body of water on the peninsula is Imuruk Lake (Figure 13) in the north-central portion of the peninsula. It is approximately 32 km² and was probably formed when volcanic lava originating in the nearby area cut off major drainage streams causing water to back up into a depression. The lake presently drains northward through the Inmachuk River. Salmon spawn at the lake outlet in the fall and the lake supports whitefish and Dolly Varden.

Other lakes important for sport fisheries or which have recreational potential are smaller in size, and have been created by glacial action in the Imuruk Basin watershed and in the Kigluaik Mountains east of Nome. Many or most of these lakes contain populations of resident Arctic char (Kretsinger 1987) while other lakes and streams in this area support anadromous Dolly Varden.

Northwest Alaska Sub-area:

The Northwest Alaska Area (statewide harvest Area X; Figure 1) includes all waters and drainages of the Kotzebue area, including drainages of the Selawik, Kobuk, Noatak, Wulik, and Kivalina rivers. The area also includes all salt water in the northern half of Eschscholtz Bay, including the Chamisso Island area and the northern half of Kotzebue Sound to and including Point Hope (ADFG 1984). The eastward limit of the sub-area extends to the Alatna River.

The most important streams of the Northwest Alaska sub-area (Figures 13, 14 and 15) are the Noatak and Kobuk rivers, both of which drain large areas of the southern slope of the western Brooks Range. Each has a drainage area of approximately 31,000 km² and stream length of from 560 km (Kobuk) to 640 km (Noatak; U.S. Army Corps of Engineers 1967). The third largest stream by drainage area is the Selawik River, with an approximate area of 11,700 km². The Noatak River is slightly turbid at most times during the summer months from glacial silt entrained from mountain glaciers in the Brooks Range, while waters of the Kobuk and Selawik rivers are basically clear. Abundant groundwater resources are found in both the Noatak and Kobuk rivers as water-bearing gravel aquifers on the lower main stem of the Noatak River and in tributaries of the Kobuk River. These aquifers tend to stabilize flows and water temperature fluctuations and provide water storage within the systems.

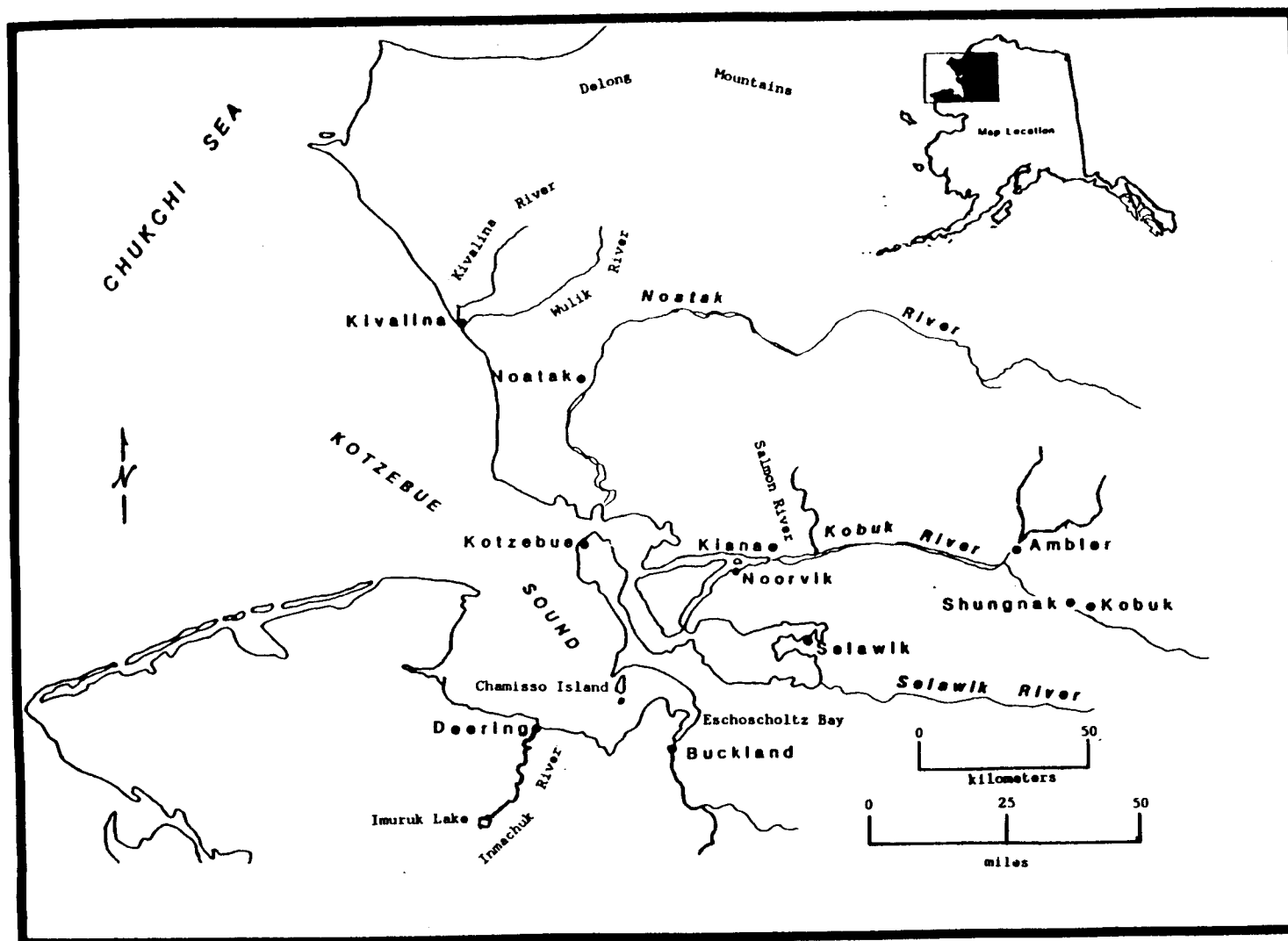


Figure 13. Kotzebue Sound and surrounding area.

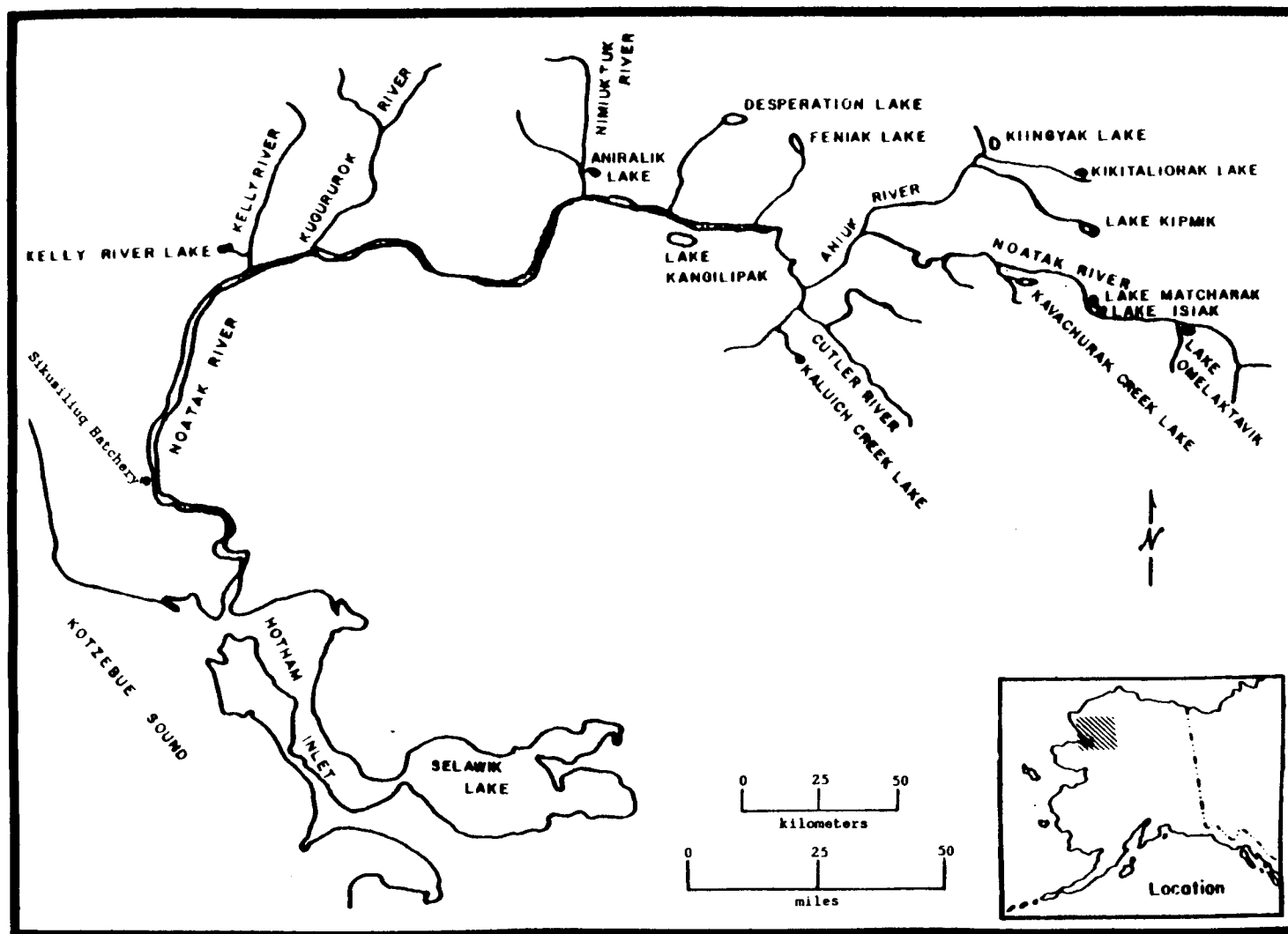


Figure 14. Waters of the Noatak River.

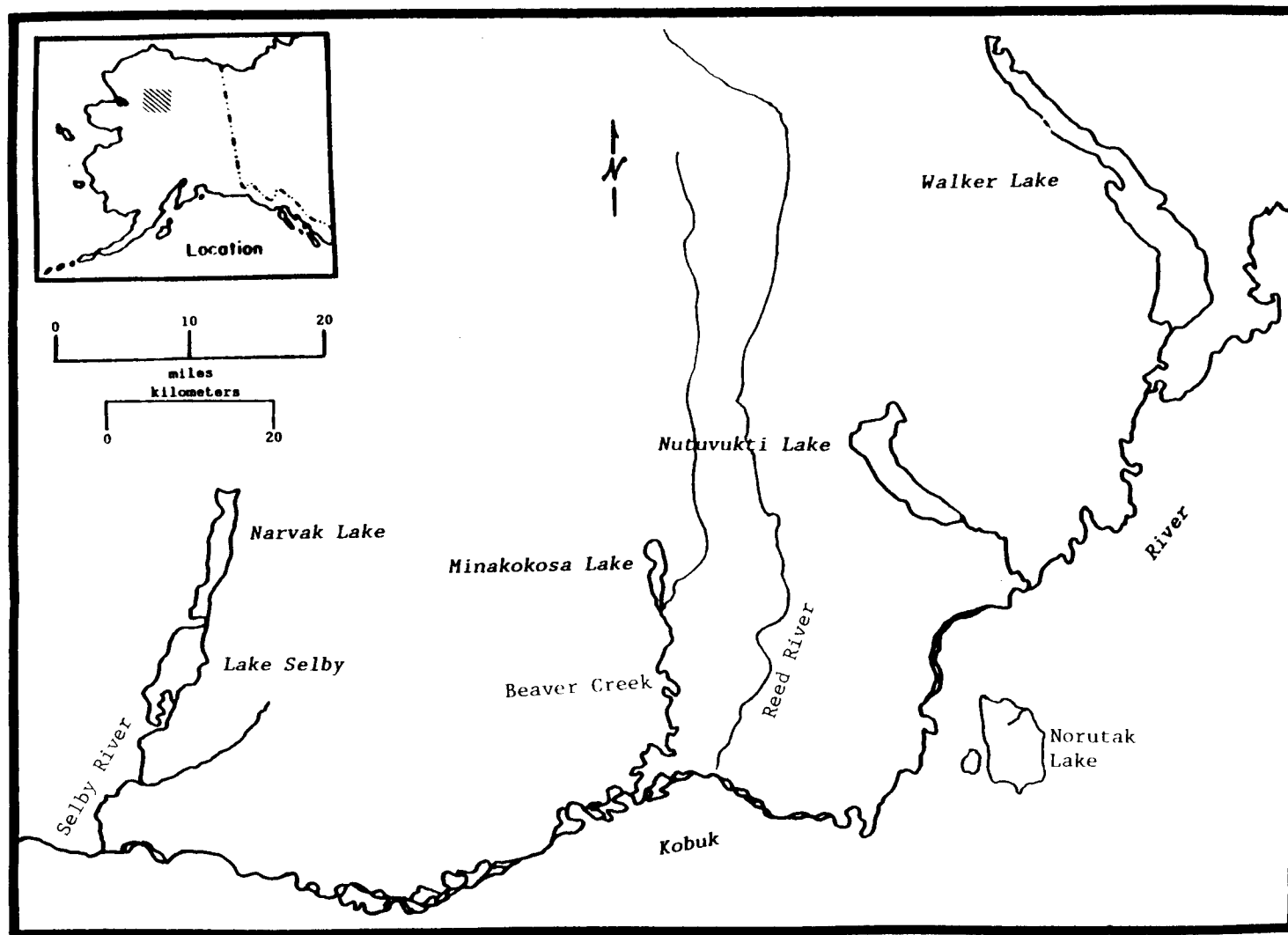


Figure 15. Waters of the upper Kobuk River.

The Noatak River is designated as a National Wild and Scenic River, and most of the drainage is included in the Noatak National Preserve (Figure 16). The extreme upper headwaters of both the Noatak and Kobuk rivers are included in Gates of the Arctic National Park. A part of the lower Kobuk Valley between Kiana and Ambler is included in the Kobuk National Park, and the Salmon River tributary, as well as the upper main stem of the Kobuk River are National Wild and Scenic Rivers as is the Selawik River. Much of the Selawik River valley is part of the Selawik National Preserve.

The three large river systems contain abundant fisheries resources. The Noatak River supports a large return of late-run chum salmon that are the primary species for the Kotzebue-based commercial fishery. Many thousands of anadromous Dolly Varden overwinter and spawn in the river. Whitefish and northern pike are resident in the Noatak River but sheefish apparently use the river mainly for feeding but not for spawning (Alt 1987a).

Both the Selawik and Kobuk rivers support spawning populations of sheefish in their upper main stems. The brackish delta systems which have formed at the river mouths serve as overwinter feeding areas for juvenile as well as adult sheefish. Trophy sheefish are taken from these waters especially during the fall when large mature spawners are available in the upper Kobuk River. Abundant whitefish utilize the rivers and delta areas, including Selawik Lake and Hotham Inlet (Kobuk Lake). Dolly Varden are abundant in some tributaries to the Kobuk River, as are northern pike in sloughs and connecting lakes to the lower river and lake trout in deeper lakes of the upper Kobuk watershed. The Wulik and Kivalina rivers, which empty into the Chukchi Sea near the village of Kivalina, are well known as trophy streams for Dolly Varden.

Sport fishing effort in Northwest Alaska is relatively light compared to most other areas in the state. Heaviest use occurs on the Noatak, Kobuk, and Wulik rivers. Many visitors to Gates of the Arctic National Park and Kobuk Valley National Park participate in float trips on the Kobuk River from Walker Lake to Kobuk village (Alt 1984; ADFG 1986; NPS 1984, 1985a). A lodge on Walker Lake promotes lake trout and Arctic char fishing. Summer hook and line fishing for sheefish from beaches in the vicinity of Kotzebue targets stocks from the Selawik and Kobuk River populations.

The Noatak River is utilized for fishing recreation by guided parties from outside the area as well as by unguided floating parties and Kotzebue residents who boat to different parts of the river to fish. The most popular fishing area is the Kelly River, but other tributaries such as the Nimiuktuk and Kugururok rivers also receive occasional use (Alt 1978, 1981), primarily for Dolly Varden.

Raft, canoe, and kayak trips are increasingly popular recreational uses on the Noatak River. Many river parties put in at Lake Matcharak (Figure 14) and portage to the river, or land on gravel bars farther up the river (Alt 1978). Arctic grayling, Dolly Varden, and lake trout are available in the upper Noatak River, but below the Nimiuktuk River, chum salmon, and northern pike also occur (Alt 1978). Lake trout occur in Matcharak Lake and in other lakes in the middle and upper Noatak drainage. Most lakes in the area are accessible only by floatplane.

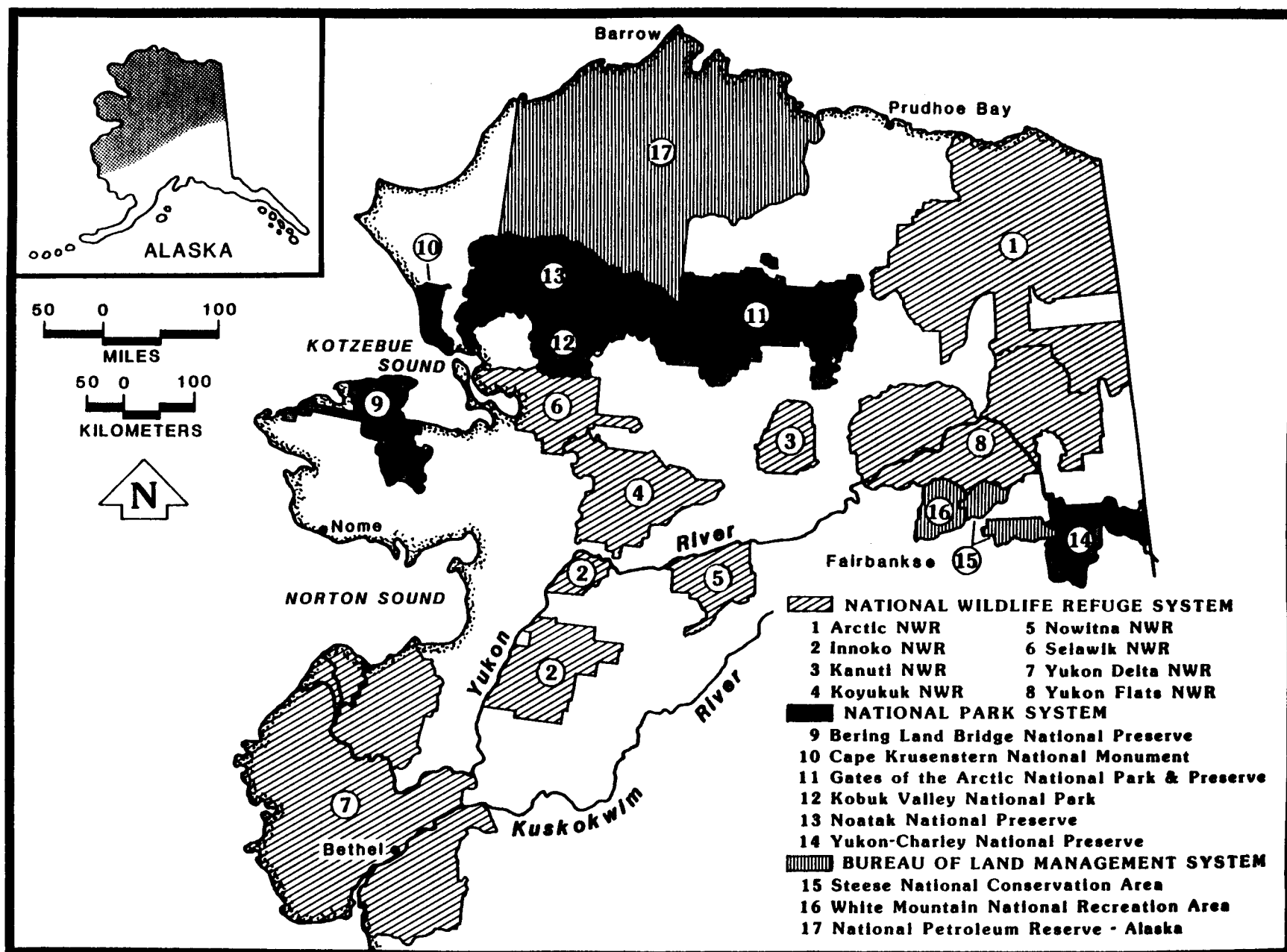


Figure 16. Federal land designations within the A-Y-K region.

The lower floodplains of the Kobuk and Selawik rivers, especially in the vicinity of the Kobuk River delta, and the lower Noatak River (above the lower canyon of the Noatak) contain hundreds of shallow thaw lakes of various sizes. The lower Selawik River is particularly well supplied with numerous lakes. Most of the waters in this area are poorly inventoried, but are known to seasonally support large populations of whitefishes, northern pike, and sheefish. The mountains in the upper Kobuk River drainage (Figure 15) contain several relatively large, deep lakes which were formed by glacial action. Although complete fisheries inventories are not available, lake trout, Arctic grayling, Arctic char and whitefish are known to utilize these lakes. They include Walker Lake, Nutuvukti Lake, Minakokosa Lake, Lake Selby and Narvak Lake.

Lakes of the upper Noatak River (Figure 14) were surveyed by Alt (1978), with a brief inventory of 13 lakes in the upper drainage. Fish were present in all lakes surveyed, and round whitefish *Prosopium cylindraceum*, lake trout and Arctic grayling were the most common species. Least cisco, northern pike, Dolly Varden, slimy sculpin *Cottus cognatus*, salmon (chum and sockeye), and ninespine stickleback *Pungitius pungitius* were also taken.

South Slope Brooks Range Sub-area:

The south slope of the Brooks Range sub-area (statewide harvest Area Y; Figure 1) includes all drainages south of the Brooks Range, west of and including the Koyukuk and Alatna River drainages, and north of the Yukon River, including all northern tributaries of the Yukon River from Kaltag to the Canadian border.

A major portion of the south slope Brooks Range sub-area is contained within the boundaries of the Gates of the Arctic National Park and Preserve. Most of the streams in the area drain to the south from the Brooks Range into the Yukon, Koyukuk, and Porcupine rivers (Figures 17, 18, and 19). Significant flowing waters include the Alatna River, and other Koyukuk River tributaries such as the Gisasa, Kateel, Dulbi, Huslia, Indian, Kanuti, Hogatza, Dakli, Henshaw, John, Wild, North Fork, Tinayguk, South Fork, Middle Fork, and Jim rivers. To the east are the Dall, Hodzana and Hadweenzic rivers, the Chandalar River with several tributaries and forks, the Christian River, and the lower Porcupine River with tributaries such as the Sheenjek, Coleen, Black, and Little Black rivers. The Dalton Highway (North Slope Haul Road) bisects the sub-area in a north-south direction (Figure 19), and provides access for recreational fishermen to several streams of the area, including the Ray River, the Middle Fork and South Fork of the Koyukuk River, as well as Prospect Creek and Jim River of the upper Koyukuk River system.

The Nulato River enters the Yukon River near Nulato, about 775 km from the mouth of the Yukon. Smaller and more difficult to navigate than the Anvik River, the stream nevertheless has sport fishing potential for chinook and coho salmon, Arctic grayling, Dolly Varden and northern pike.

The mouth of the Melozitna River supports fisheries for sheefish and Arctic grayling during summer and early fall. Geothermal hot springs occur on one of

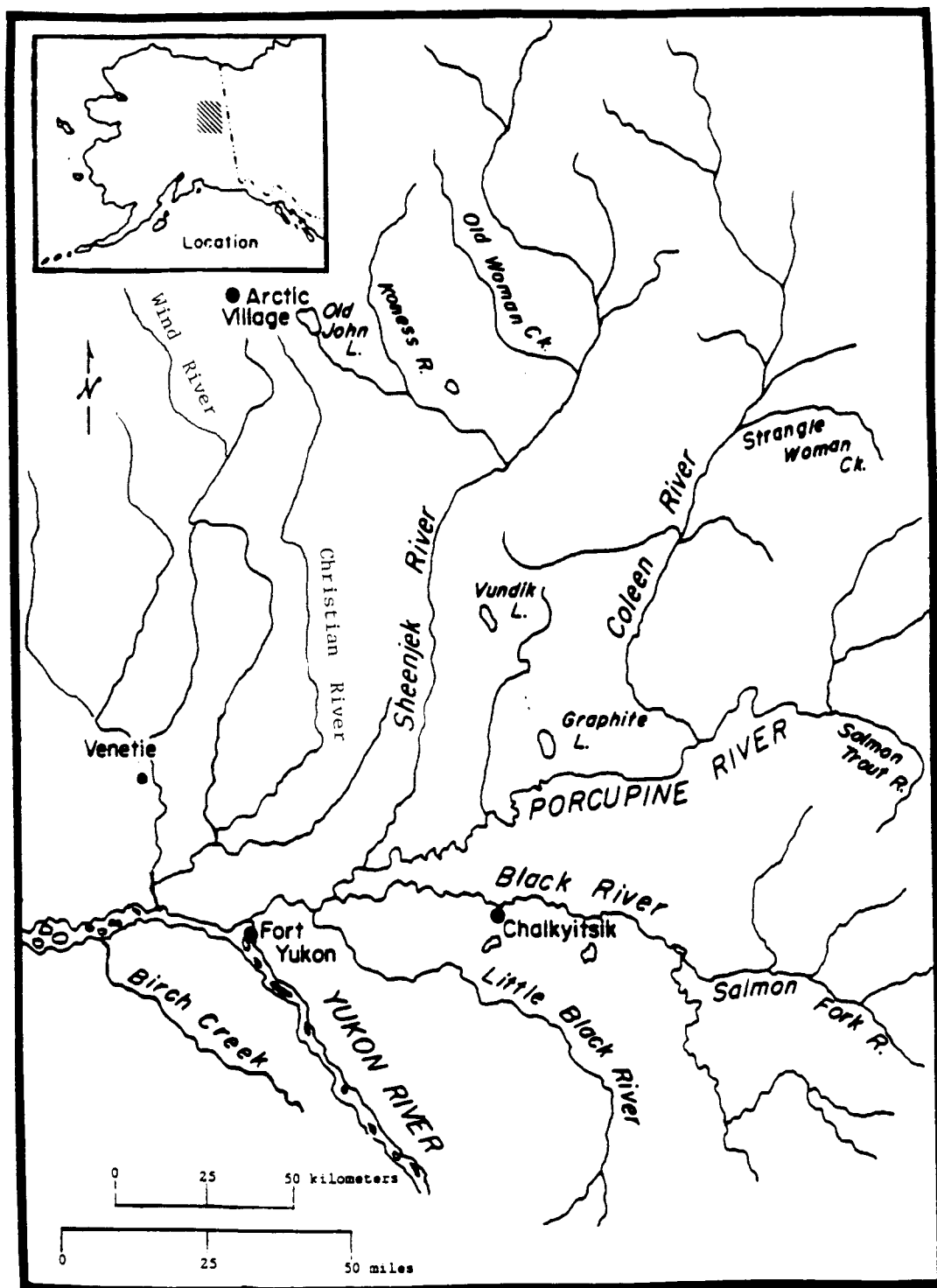


Figure 17. Porcupine River drainage.

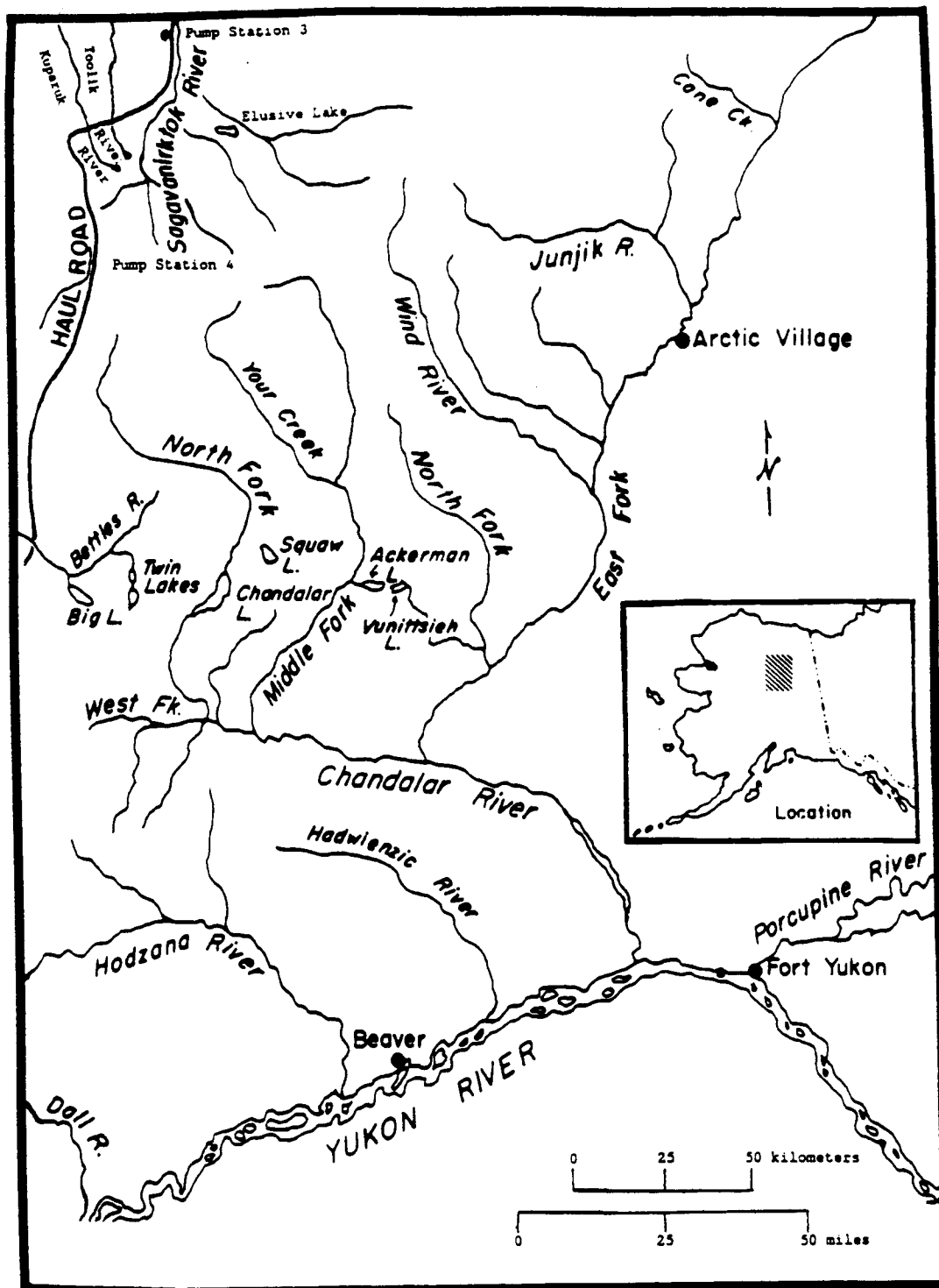


Figure 18. Chandalar River system.

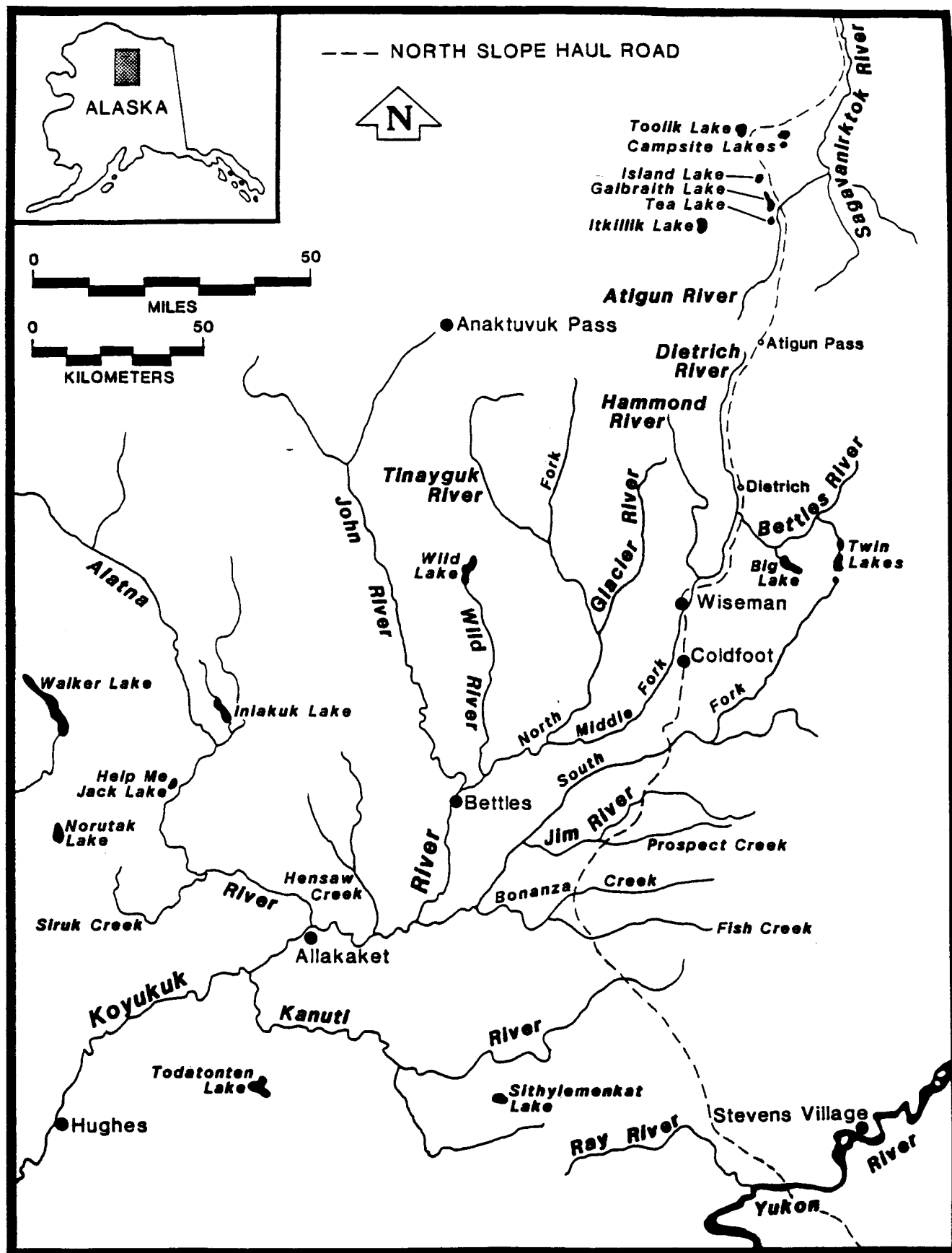


Figure 19. Upper Koyukuk River and North Slope Haul Road.

the creeks of the Melozitna River, and a permanent lodge there caters to hunters and fishermen. The Melozitna River is also utilized frequently by local fishermen for Arctic grayling, particularly in the lower 16 km below rapids which effectively isolate the upper reaches of this stream.

The Koyukuk River, one of the largest first order tributaries of the Yukon, enters the Yukon River below Galena, about 820 km from the mouth (Figure 20). The main stem of the Koyukuk is turbid in its lower reaches from tannic stain, bank erosion and leaching. Lower Koyukuk River tributaries such as the Gisasa, Kateel, Dulbi, and Indian rivers are not well known outside of the local area but seasonally provide good sport fishing opportunities. Sheefish are taken at the mouths of several streams including the Kateel and Dulbi rivers and where John Junior Slough meets the Koyukuk River about 32 km upstream from the mouth. Arctic grayling are common in all local streams and are heavily fished at times by local people from nearby villages as well as by military personnel stationed at the Galena Air Station. Since sheefish spawn annually in the main stem of the Koyukuk River near Hughes, there are both immature and adult mature prespawning individuals present in the lower Koyukuk River throughout the summer prior to the September spawning period (Alt 1987a). The best fishing for this species is near the mouths of tributary creeks and rivers where they enter the Yukon River main stem. Hook and line fishing is practiced by many local residents. Guided fishing for clients from outside the area occurs infrequently, with unguided "drop-off" fishing trips more common.

Other Yukon River tributaries below the Porcupine River confluence (Figures 7 and 20) that support sport fishing include the Tozitna River, Ray River, Dall River, Hodzana River, Hadweenzic River, Chandalar River, and Christian River. Upper Koyukuk River tributaries that cross the Dalton Highway (North Slope Haul Road) are illustrated in Figure 19.

The Yukon Flats is an extensive wilderness wetland between Circle and Stevens Village below the confluence of the Porcupine River. Portions of the Yukon flats that are located north of the Yukon River belong to the South Slope Brooks Range sub-area. Those portions of the Yukon Flats north of the Yukon River are considered to belong to the South Slope Brooks Range Sub-area. Thousands of shallow thaw lakes have developed throughout the flats. Many of the lakes support fish populations, at least seasonally, especially those with occasional connections to the sloughs and streams in the area. Northern pike and whitefish species are most common to this area, with sheefish and Arctic grayling also present in some waterways (USFWS 1985). Salmon production is very limited in the Yukon Flats proper. The area between Beaver Village and Fort Yukon on the Yukon River main stem is known to support sheefish spawning (Alt 1987a).

The Porcupine River (Figure 17) is the largest Yukon River tributary, draining an immense area of the eastern Brooks Range through the Sheenjek and Coleen rivers, the British Mountains through the Old Crow River, the Richardson Mountains in Canada through the Bell, Eagle, and Rock rivers, and the northern Ogilvie Mountains in north-central Yukon Territories through the east Porcupine Fork and its tributaries. The Black River which drains the southeastern slopes of the Ogilvie Mountains is one of it's major Alaskan

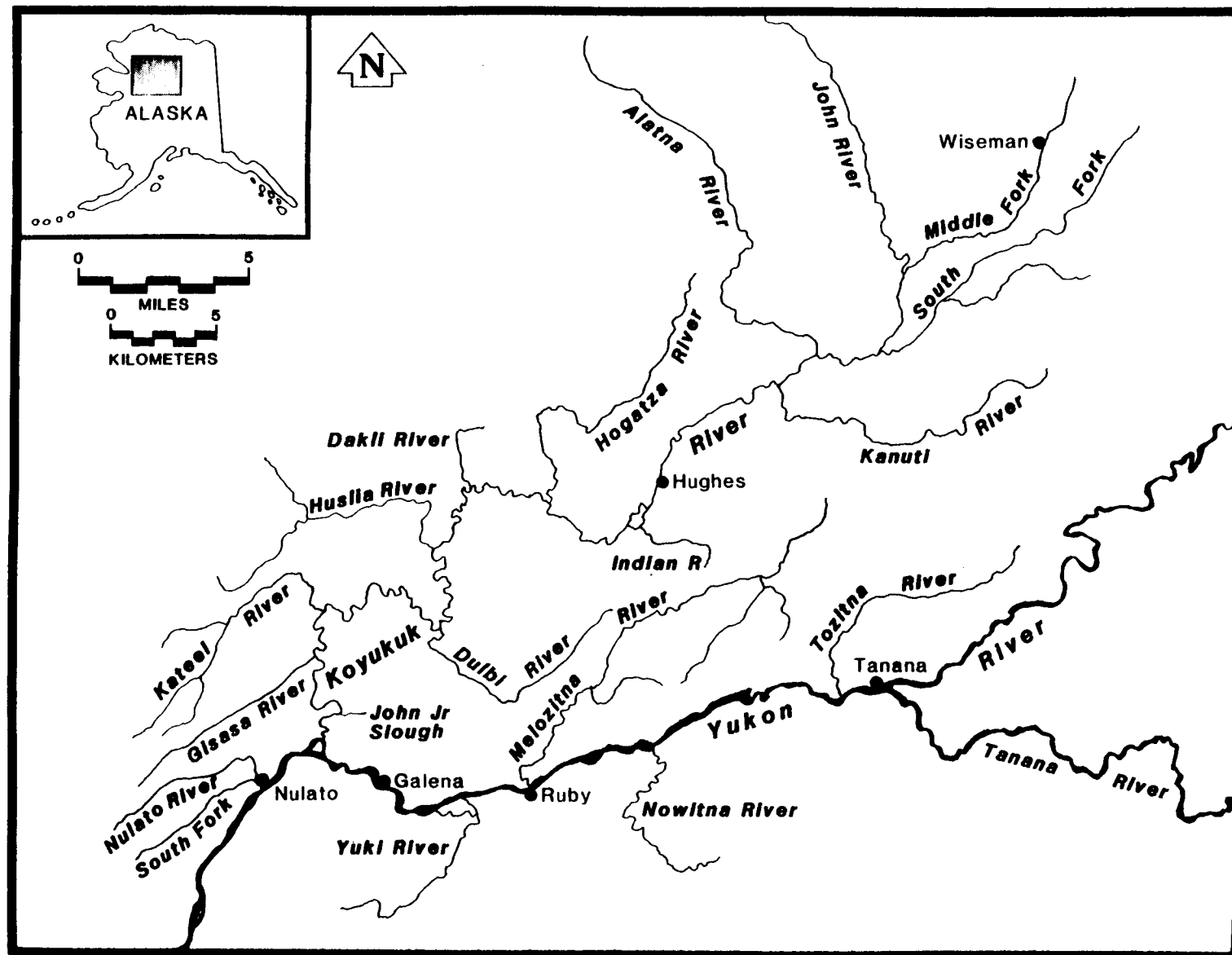


Figure 20. Middle Yukon River and Koyukuk River drainages.

tributaries. The Little Black River drains a lowland area south of the Black River parallel to the main stem of the Yukon River.

Other major tributaries between Fort Yukon and the Canadian border are all above Circle City, and include the Charley, Seventymile, and Fortymile rivers on the south side of the Yukon River (Tanana Area) and the Nation, Kandik, and Tatonduk rivers entering the north side (South Slope Brooks Range sub-area) of the Yukon River (Figure 8). Parts of Birch and Beaver creeks as well as parts of the Charley and Fortymile rivers are designated as National Wild and Scenic Rivers (Appendix A). The major species for sport fishing on the rivers upstream of Fort Yukon are Arctic grayling in the upper stream reaches and northern pike in the lower slower sections.

Several large mountain lakes are present. They include Iniakuk, Wild, Big, Twin, Chandalar, Ackerman, and Old John lakes (Figures 17, 18 and 19). All are believed to contain lake trout populations as well as Arctic grayling and other species of whitefish and cisco in most cases.

This sub-area contains approximately half of the Yukon Flats National Wildlife Refuge, (Figure 16) and there are literally thousands of lakes present of various sizes and origins. The lakes of the area are categorized roughly (USFWS 1985) into: (1) foothill lakes (formed from streams, with sufficient depth for fish habitation); (2) tundra lakes (which are shallow and often freeze to the bottom); and (3) lowland lakes of three types: oxbow lakes with river connections and deep enough to support fish, mud lakes (shallow, and suitable for only fish rearing), and lakes created from beaver activity. There is currently little documentation available on resident fishes that utilize these vast wetlands. The U.S. Fish and Wildlife Service is conducting inventories and lake surveys in the waters of the Yukon Flats Refuge to provide information on this subject.

North Slope Brooks Range Sub-area:

The north slope of the Brooks Range sub-area (statewide harvest Area Z; Figure 1) includes all waters north of the Brooks Range divide flowing into the Beaufort and Chukchi Seas from Point Hope on the west to the Canadian border on the east including adjacent saltwater areas.

The northern-most part of Alaska is characterized by its broad arctic coastal plain, which abuts the Arctic Ocean and Beaufort Sea, and by the foothills and mountains which form the Brooks Range (Figure 21). The central and eastern Brooks Range consist of rugged, glaciated, east-trending ridges with summits rising to elevations of 4,350 to 5,000 m, (Selkregg 1976). The Delong Mountains on the western flank of the Brooks Range consist of glaciated ridges, 1,865 to 2,500 m in elevation, which drain northward into the Chukchi Sea (Selkregg 1976). No lakes or glaciers exist in the Delong Mountains although they were glaciated during the ice age. From the central and eastern Brooks Range, the mountain rivers flow northward to empty into the Beaufort Sea. As Selkregg (1976) points out, although several large rock basin lakes lie at the mouths of glaciated valleys on both sides of the range, there are surprisingly few lakes for a glaciated area. Although most of the streams that cross the foothills flow northward from their sources in the range, the

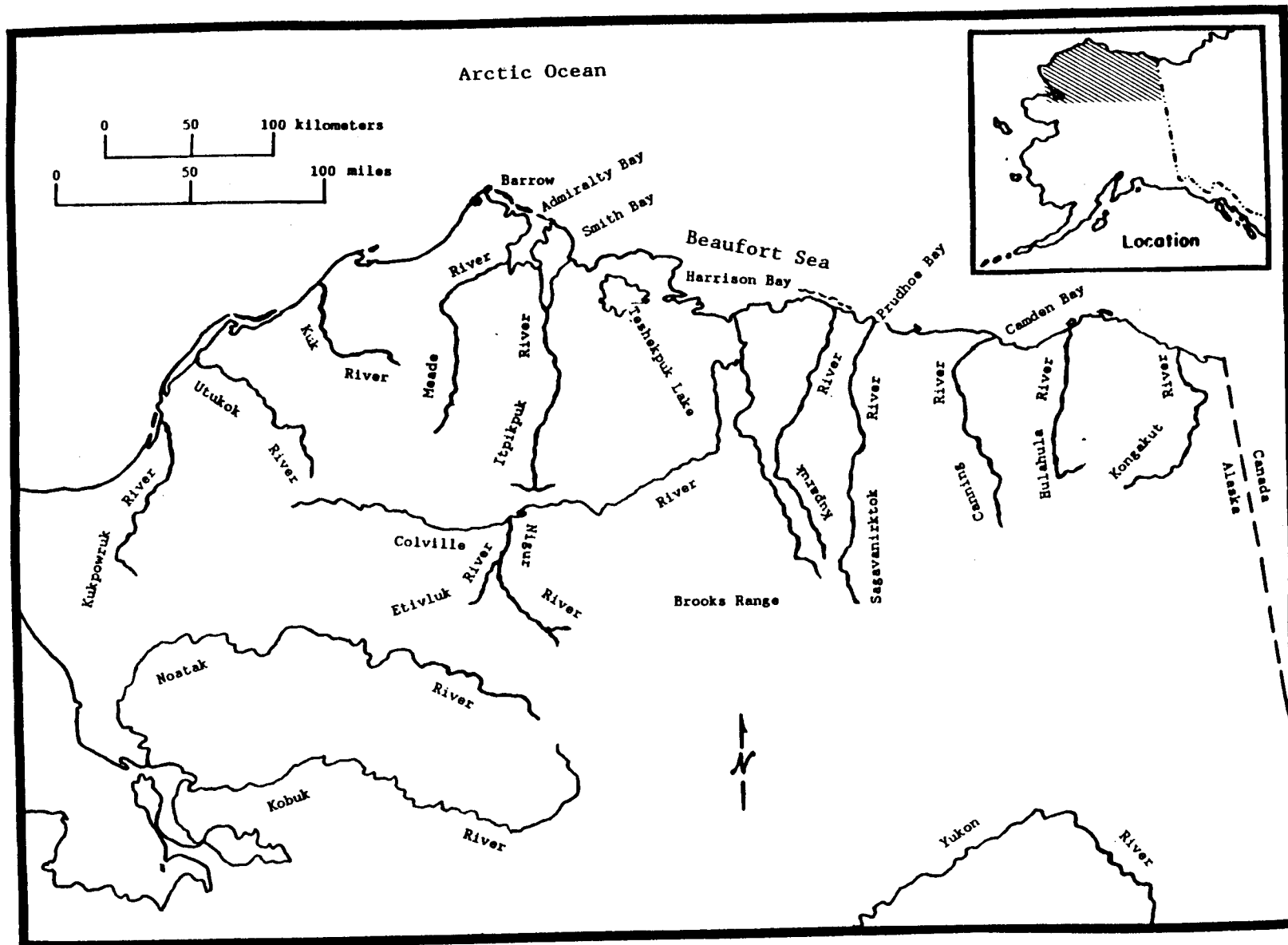


Figure 21. Waters of the Arctic Slope.

sub-area's largest stream, the Colville River flows eastward for more than 320 km before turning north onto the coastal plain (Figures 21 and 22). The drainage area of the Colville River is estimated to be about 62,000 km², a little more than half of the area drained by the Tanana River. Most streams east of the Colville River have braided courses across broad gravel flats which often become blocked in winter by aufeis (fields of ice that form continuously downstream from spring water sources) that causes local flooding (Selkregg 1976). The upper valleys of major rivers flowing from the Brooks Range often contain morainal lakes.

The coastal plain is an area of low relief and very poor drainage due to underlying permafrost and a very shallow active layer, factors that lead to moisture entrapment near the surface. Rivers that cross the plain originate in the hills or mountains to the south. In the western part, more than 50% of the plain is covered by oriented thaw lakes that are aligned to the north-northwest on their long axes (Selkregg 1976). Ice-wedge polygons are found throughout the coastal plain section.

Major flowing waters of the coastal plain from west to east, include the Kukpowruk, Utukok, Kuk, Meade, and Itpikpuk rivers (Figure 21). The Colville River has several major tributaries, including the Killik, Chandler, Anaktuvuk, and Itkillik rivers (Figure 22). Other streams east of the Colville include the Kuparuk, Sagavanirktok, Canning, Hulahula, and Kongakut rivers (Figure 21).

Access to the North Slope area is either by plane or the Dalton Highway. The highway was originally built in 1974 to support construction of the trans-Alaska oil pipeline. Sport fishing was closed for 8 km (5 mi) on either side of the pipeline beginning in 1978. The closure was rescinded in 1980 by the Alaska Board of Fisheries, which opened the Haul Road Corridor for fishing for all species except sheefish and salmon, (Bendock 1980). Since June 1981 the highway south of Disaster Creek (near Dietrich, Figure 19) has been open to the general public (Bendock 1982). The Alaska Board of Fisheries opened the Haul Road Corridor for sheefish fishing in 1987.

The Dalton Highway crosses tributaries of the Sagavanirktok, Toolik, and Kuparuk rivers and parallels the Sagavanirktok River for about 160 km (100 mi) south of Prudhoe Bay, providing sport fishing opportunities for Arctic grayling, lake trout, and Arctic char (Figure 19). There are numerous small lakes between Ribdon River (tributary to the Sagavanirktok River) and Galbraith Lake that provide good fishing opportunities for these species (Figure 23).

Sport fishing also takes place on the Colville, Kongakut, Canning, Ivishak, Echooka, Killik, and Anaktuvuk rivers, as well as the Hulahula River (Bendock 1979; ADFG 1986). Some fishing may also be done by parties floating the Nigu and Etivluk rivers (Bendock 1983). A significant proportion of the sport fishing done in this sub-area takes place by persons engaged in hunting activities as their main pursuit.

Lakes in the vicinity of Toolik Lake and the Upper Kuparuk and Sagavanirktok rivers are the most frequently fished areas north of Atigun Pass (Bendock and

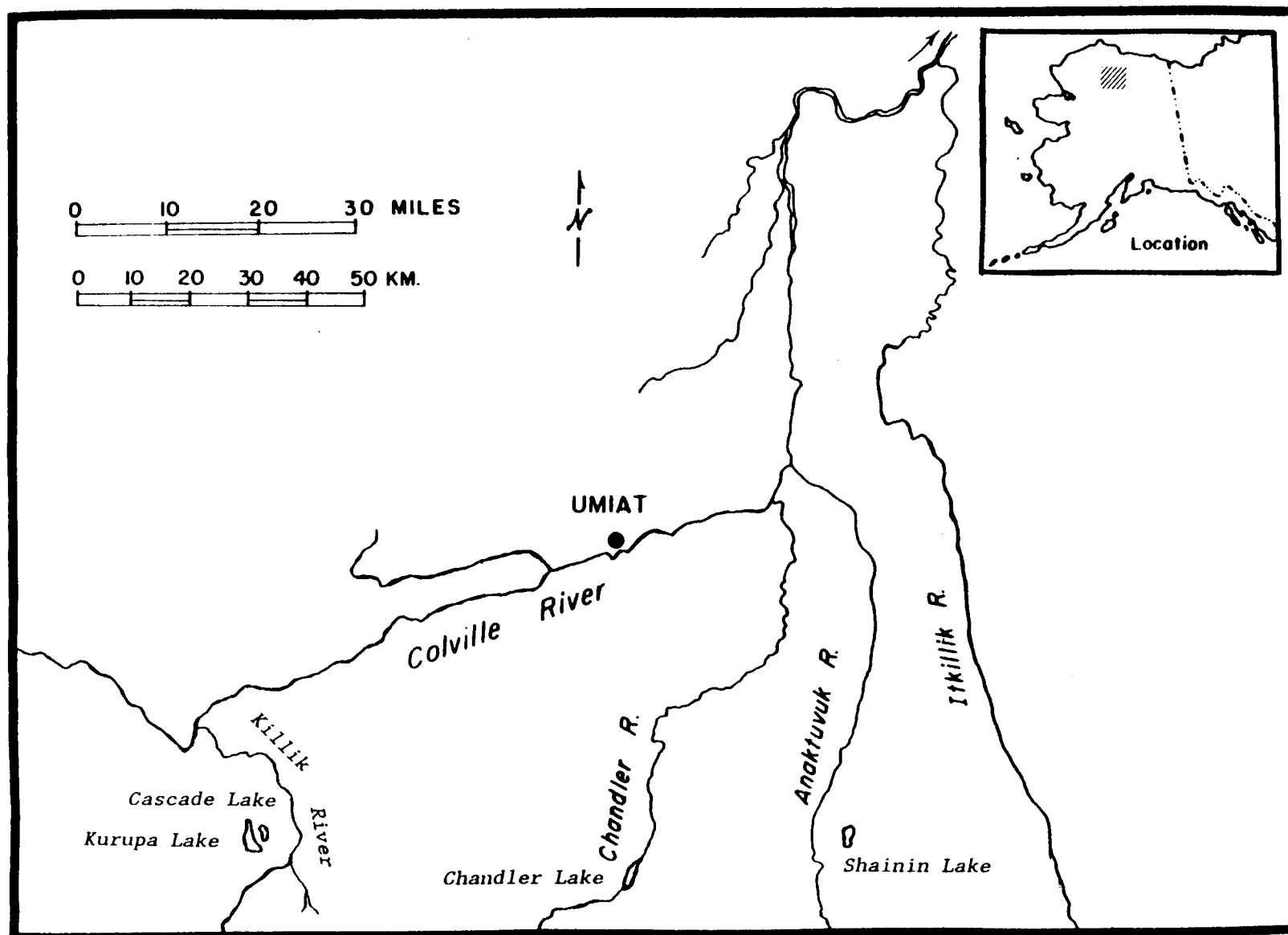


Figure 22. Principal tributaries of the Colville River.

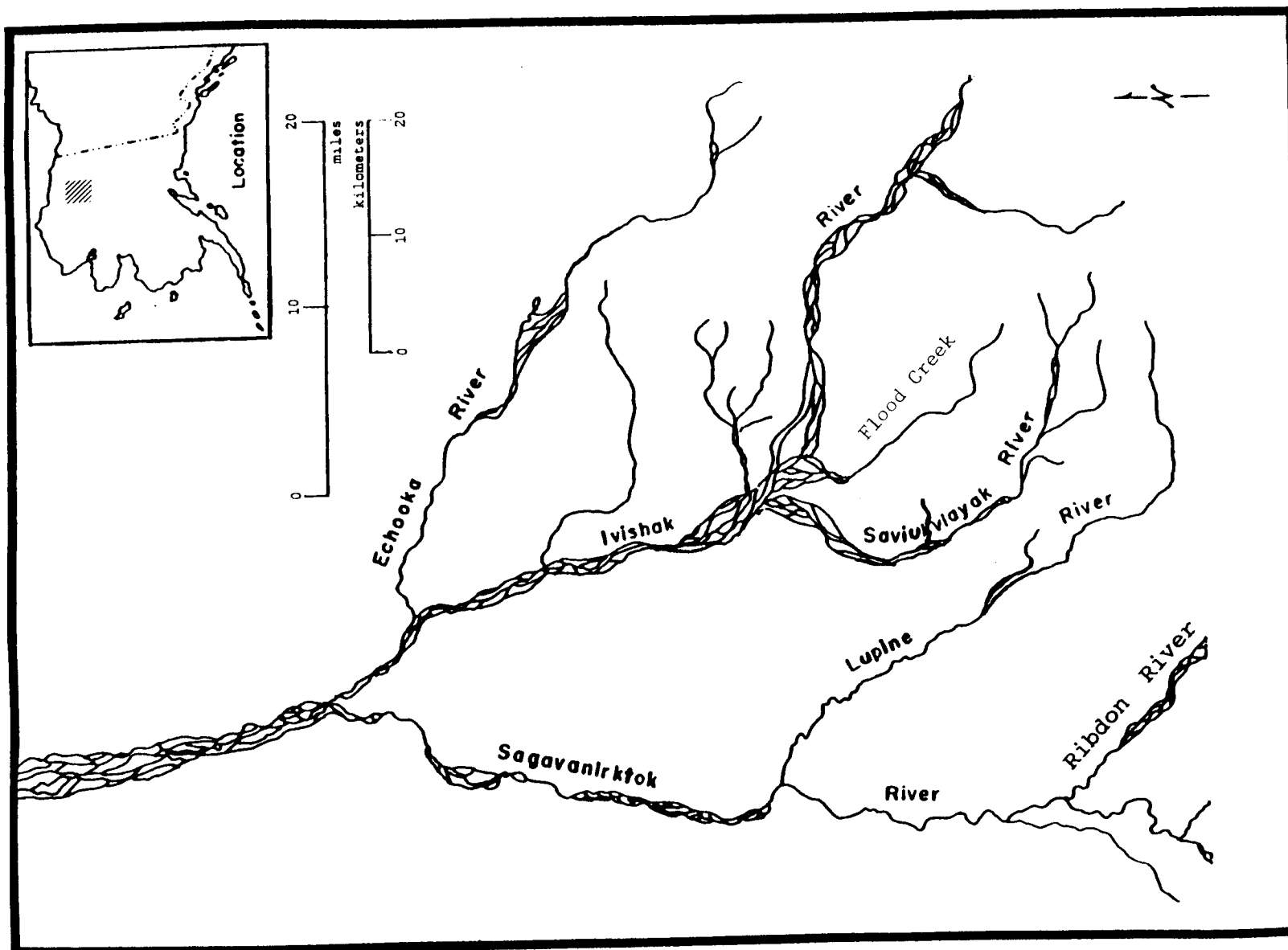


Figure 23. Principal tributaries of the Sagavanirktok River.

Burr 1984). Other popular lakes along the Haul Road include Galbraith, Island, and Tea lakes (Bendock 1980). Lakes outside the Dalton Highway Corridor that receive some sport fishing effort include Elusive, Shainin, Itkillik, and Chandler lakes (Figures 20 and 22; Furniss 1974; NPS 1985a). Lakes that receive occasional sportfishing effort within the Colville River drainage include Cascade and Kurupa lakes (Figure 22; Bendock 1982).

Climate

Because the area is so immense and varied in topography there is extreme variation in average annual climate. Except for the immediate coastal areas, the majority of the area has a continental type of climate, with cool summers and cold winters. Annual precipitation varies a great deal but generally tends to be sparse except for the areas under coastal influence. In lower latitudes, the amount of precipitation generally received in the AYK Area would result in arid conditions similar to those found in many deserts of the world. Because of cooler temperatures in Alaska, and the fact that a great deal of moisture is trapped in permafrost soils, desertification has not occurred, and, in fact, much of the area gives the appearance of having received abundant moisture. Typical summer weather lasts from mid-June until late August or early September in some areas, with rainy weather typical during August and September. Snowfall is usually light even in the coastal areas of AYK, compared to other areas of the state.

Primary Species For Sport Fishing

In addition to the species listed for the Tanana Area, Dolly Varden and/or Arctic char are important to sport fishing in many waters of the AYK Area. Wild stocks of rainbow trout occur upstream in the Kuskokwim River drainage as far as the Aniak River and its tributaries. Rainbow trout do not naturally occur north of the Kuskokwim River. There have been no hatchery plantings of rainbow trout in the AYK Area. Pink salmon are an important sport fish species in the Norton Sound and Seward Peninsula sub-area where there is sport fishing effort in both freshwater and marine waters. Additional species of whitefish that are of importance to fisheries in the AYK Area include the broad whitefish, *Coregonus nasus*, Arctic cisco, *Coregonus autumnalis*, and Bering cisco, *Coregonus laurettae*. All other species listed under the Tanana Area are also found in the AYK Area.

Status and Harvest Trends of Wild Stocks

A brief description of the fisheries for the most prominent sport species in the AYK Area follows.

Chinook Salmon:

Important stocks of chinook salmon spawn throughout the Kuskokwim and Yukon River drainages, and in the streams of eastern Norton Sound and the southern Seward Peninsula. While chinook salmon occur in streams north of the Seward Peninsula, no stocks yet identified are sufficiently abundant to support commercial or sport fisheries. Sport fishing is concentrated in only a few streams in the AYK Area, and the majority of the sport harvest is taken by

local residents in remote areas. More intensive sport fishing occurs in Norton Sound on the Unalakleet River and on the Seward Peninsula in parts of the Fish River system where commercial guiding and lodging facilities have been developed to promote sport fishing for salmon. Other areas where guided fishing for chinook salmon occurs include the Holitna River in the Kuskokwim drainage where several guiding operations take sport fishermen into the drainage. The Salmon River near Nikolai and McGrath supports intensive sport fishing on a chinook salmon spawning stock by local people using rod and reel gear (Stokes 1985). An undocumented but substantial amount of angling for chinook salmon takes place on both the Andreafsky and Anvik rivers. Few chinook salmon are harvested in the AYK and Tanana Areas compared to other management areas statewide. Since 1980, the AYK Region chinook salmon sport harvest has ranged from about 2,000 to 4,000 fish, with the majority taken from AYK Area streams (Mills 1988). A slight increase in harvest has occurred since 1980; from 1,880 fish taken in 1980 to an estimated harvest of 2,193 chinook salmon taken in 1987 (Table 2).

Coho Salmon:

Coho salmon are distributed widely south of the Brooks Range in the AYK Area, however, abundance drops off markedly north of the Kuskokwim River. Returns of coho salmon to the Kuskokwim River may be the largest to a single river in Alaska. Approximately 660,000 coho salmon were harvested in the 1986 Kuskokwim River commercial fishery, the historic record high commercial harvest year for this system (Francisco et al. 1987). Western Alaska coho salmon are thought to spawn primarily in spring-fed portions of streams. The upper Kuskokwim River and its tributaries that drain the northern slopes of the Alaska Range, are extensively underlain with alluvial gravels as a result of outwash from the Alaska Range. The resulting gravel aquifers provide waters of essential quality for spawning and rearing of coho salmon in the Kuskokwim drainage and fall chum salmon in the Yukon and Tanana River drainages. Statewide postal harvest survey results in 1987 indicate that the majority of the coho salmon harvest in the AYK Region was in streams of the Kuskokwim and Yukon rivers exclusive of the Tanana River area (Mills 1988). The sport harvest of coho salmon from the Lower Yukon-Kuskokwim sub-area in 1987 was estimated at 4,855 fish, of which 2,300 were taken from the Kanektok River (Table 3).

Coho salmon are an important sport species north of the Yukon River in Norton Sound, where coastal and stream fisheries occur at least as far north as Teller. Several streams of eastern Norton Sound (Figures 11 and 12) including the Unalakleet, and Shaktoolik, Fish, and Niukluk rivers support runs of coho salmon, as do many of the streams in the Nome area, Port Clarence, and Safety Sound. Sport fisheries occur in these areas that target coho salmon. Statewide survey results for 1987 estimate the Norton Sound coho salmon harvest to be 2,319 fish (Table 4). Coho salmon occur north of Port Clarence, but as with other rearing salmon species, their abundance decreases markedly at higher latitudes.

Table 2. Arctic-Yukon-Kuskokwim Region sport fish harvests by species, 1977-1987^a.

Species	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
<u>AYK Region (both management areas):</u>											
Chinook Salmon	499	1,095	1,159	1,880	1,875	2,514	3,697	1,819	2,687	2,860	2,193
Sea-Run Coho Salmon	973	1,447	2,983	3,536	2,132	5,961	5,932	12,036	3,192	8,693	8,441
Landlocked Coho/											
Chinook Salmon	7,151	22,412	36,073	25,733	57,294	43,374	34,255	29,245	41,042	24,061	26,624
Sockeye Salmon	69	85	126	112	117	430	261	650	169	439	1,364
Pink Salmon	2,524	8,328	2,918	7,844	3,118	14,214	5,286	8,712	1,206	3,404	1,322
Chum Salmon	1,246	1,992	1,701	2,773	3,640	5,781	4,698	3,274	3,036	4,336	2,768
Rainbow Trout	6,215	6,768	5,587	20,419	25,553	26,982	22,447	35,477	34,091	31,774	32,416
Lake Trout	2,269	1,100	1,601	2,289	2,821	5,127	4,094	3,624	5,354	3,250	1,113
Dolly Varden/											
Arctic Char	4,908	4,538	8,508	8,797	8,748	14,129	20,617	13,232	14,660	10,373	12,369
Arctic Grayling	67,168	94,564	89,472	100,546	96,180	108,796	123,163	99,142	81,226	65,725	57,956
Northern Pike	11,661	11,753	11,979	15,642	15,125	17,257	18,834	14,217	15,703	18,996	14,222
Whitefish	4,154	7,482	6,014	7,692	5,449	12,351	13,057	11,892	20,860	31,770	27,159
Burbot	1,773	1,889	2,097	3,363	4,806	5,783	5,595	5,933	5,215	5,611	4,017
Sheefish	1,247	1,291	1,542	2,411	2,239	3,281	3,323	3,947	2,520	3,721	2,597
Smelt	0	0	0	0	0	0	0	0	8,750	464	7,080
Halibut	0	0	0	0	0	0	0	0	62	0	36
Other Fish	3,214	1,293	2,297	3,513	3,232	8,561	8,827	1,883	1,336	1,349	0
Total	115,071	166,037	174,057	206,550	232,329	274,541	274,086	245,083	241,109	216,826	201,677

^a From Mills 1988

-continued-

Table 2. (page 2 of 3).

Species	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
<u>AYK Area:</u>											
Chinook Salmon	399	932	644	939	1,112	1,530	2,649	1,481	1,331	2,079	1,691
Sea-Run Coho Salmon	879	1,308	2,958	3,469	2,087	5,909	5,785	11,205	2,396	7,319	7,210
Landlocked Coho/ Chinook Salmon	0	0	0	0	0	0	0	0	0	0	58
Sockeye Salmon	69	85	126	112	117	430	261	650	169	439	1,364
Pink Salmon	2,524	8,328	2,918	7,844	3,118	14,214	5,286	8,712	1,206	3,404	1,322
Chum Salmon	946	1,834	1,482	2,290	3,045	5,083	4,049	2,689	1,781	3,643	2,148
Rainbow Trout	223	362	401	835	982	796	1,783	1,455	659	504	592
Lake Trout	798	497	655	1,025	1,100	2,023	1,157	1,520	2,370	2,537	461
Dolly Varden/ Arctic Char	4,031	4,014	8,144	8,273	8,176	13,647	20,324	12,882	13,430	10,173	12,333
Arctic Grayling	9,375	11,289	19,229	20,396	20,892	27,043	30,800	15,516	17,666	19,744	19,476
Northern Pike	2,316	3,915	4,004	6,190	5,184	7,435	8,609	4,610	3,613	7,062	4,751
Whitefish	776	909	855	1,705	576	3,708	4,746	234	630	4,960	724
Burbot	226	506	118	663	684	1,896	555	377	420	469	162
Sheefish	1,089	1,057	1,263	2,315	2,146	3,154	3,166	3,609	2,100	3,649	2,362
Smelt	0	0	0	0	0	0	0	0	8,750	464	7,080
Halibut	0	0	0	0	0	0	0	0	62	0	36
Other Fish	2,482	1,212	2,218	3,513	3,124	8,551	8,806	1,844	1,336	1,178	0
Total	26,133	36,248	45,015	59,569	52,343	95,419	97,976	66,784	57,919	67,624	61,770

^a From Mills 1988

-continued-

Table 2. (page 3 of 3)

Species	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
<u>Tanana Area:</u>											
Chinook Salmon	100	163	515	941	763	984	1,048	338	1,356	781	502
Sea-Run Coho Salmon	94	139	25	67	45	52	147	831	796	1,374	1,231
Landlocked Coho/ Chinook Salmon	7,151	22,412	36,073	25,733	57,294	43,374	34,255	29,245	41,042	24,061	26,566
Sockeye Salmon	0	0	0	0	0	0	0	0	0	0	0
Pink Salmon	0	0	0	0	0	0	0	0	0	0	0
Chum Salmon	300	158	219	483	595	698	649	585	1,255	693	620
Rainbow Trout	5,992	6,406	5,186	19,584	24,571	26,186	20,664	34,022	33,432	31,270	31,824
Lake Trout	1,471	603	946	1,264	1,721	3,104	2,937	2,104	2,984	713	652
Dolly Varden/ Arctic Char	877	524	364	524	572	482	293	350	1,230	200	36
Arctic Grayling	57,793	83,275	70,243	80,150	75,288	81,753	92,363	83,626	63,560	45,981	38,480
Northern Pike	9,345	7,838	7,975	9,452	9,941	9,822	10,225	9,607	12,090	11,934	9,471
Whitefish	3,378	6,573	5,159	5,987	4,873	8,643	8,311	11,658	20,230	26,810	26,435
Burbot	1,547	1,383	1,979	2,700	4,122	3,887	5,040	5,556	4,795	5,142	3,855
Sheefish	158	234	279	96	93	127	157	338	420	72	235
Other Fish	732	81	79	0	108	10	21	39	0	171	0
Total	88,938	129,789	129,042	146,981	179,986	179,122	176,110	178,299	183,190	149,202	139,907

^a From Mills 1988

Table 3. Lower Yukon-Kuskokwim sub-area^a sport fish harvest and effort by fisheries and species^b, 1987^c.

	Anglers	Trips	Days Fished	KS	SS	LL	RS	PS	CS	LT	DV AC	RT	GR	WF	SF	NP	BB	HA
SALTWATER:																		
Boat	270	462	380	118	91	0	0	0	56	0	0	0	0	0	0	0	0	36
SALTWATER TOTAL	236 ^d	462	380	118	91	0	0	0	56	0	0	0	0	0	0	0	0	36
FRESHWATER:																		
Kanektok River	1,787	2,216	9,689	508	2,300	0	153	18	111	14	752	132	244	0	0	0	0	0
Other Streams	2,933	5,297	8,798	355	2,464	58	266	0	566	14	1,394	453	2,248	84	452	836	126	0
Lakes	67	92	91	0	0	0	0	0	0	0	14	7	14	7	0	42	0	0
FRESHWATER TOTAL	3,910 ^d	7,605	18,578	863	4,764	58	419	18	677	28	2,160	592	2,506	91	452	878	126	0
GRAND TOTAL	4,011 ^d	8,067	18,958	981	4,855	58	419	18	733	28	2,160	592	2,506	91	452	878	126	36

^a All southern drainages of the Yukon River from its confluence with the Tanana River to Kaltag; all drainages of the Yukon River south of Kaltag, including the Kuskokwim River and all waters flowing into Kuskokwim Bay; does not include the Tanana River and the Koyukuk River drainages (Area V in the statewide harvest report).

^b KS: chinook salmon; SS: coho salmon; LL: landlocked coho or chinook salmon; RS: red salmon; PS: pink salmon; CS: chum salmon; LT: lake trout; DV/AC: Dolly Varden or Arctic char; RT: rainbow trout; GR: Arctic grayling; WF: whitefish; SF: sheefish; NP: northern pike; BB: burbot; SM: smelt; HA: halibut

^c From Mills 1988.

^d Angler totals may not equal sum of sites due to some anglers fishing at more than one site.

Table 4. Seward Peninsula-Norton Sound^a sport fish harvest and effort by fisheries and species^b, 1987^c.

	Anglers	Trips	Days Fished	KS	SS	RS	PS	CS	DV AC	GR	WF	NP	SM
SALTWATER:													
Boat	135	123	688	0	453	0	0	0	0	0	0	0	0
Shoreline	169	277	344	72	36	0	0	0	0	0	0	0	0
SALTWATER TOTAL	303 ^d	400	1,032	72	489	0	0	0	0	0	0	0	0
FRESHWATER:													
Streams	3,643	6,373	18,099	507	834	924	1,177	742	4,130	2,481	272	435	2,023
Systems	640	893	2,282	36	996	0	127	72	1,376	2,119	0	471	0
FRESHWATER TOTAL	2,528 ^d	7,266	20,381	543	1,830	924	1,304	814	5,506	4,600	272	906	2,023
GRAND TOTAL	2,697 ^d	7,666	21,413	615	2,319	924	1,304	814	5,506	4,600	272	906	2,023

^a Seward Peninsula-Norton Sound (Area W): All drainage area north of the Yukon River drainage, including all saltwater north and west of Pastol Bay in Norton Sound; and, south of the Selawik River drainage. Does not include the Selawik River.

^b KS: chinook salmon; SS: coho salmon; RS: red salmon; PS: pink salmon; CS: chum salmon; DV/AC: Dolly Varden or Arctic char; GR: Arctic grayling; WF: whitefish; NP: northern pike; SM: smelt;

^c From Mills 1988

^d Angler totals may not equal sum of sites due to some anglers fishing at more than one site.

Pink Salmon:

This species rarely undertakes extensive freshwater migrations (more than 160 km) and as a consequence, it is not an abundant species upstream of the lower main stems of the major river systems of the AYK Region. For example, pink salmon seldom ascend the Yukon River beyond the Anvik River, or the Kuskokwim River beyond the Holitna River. A significant sport harvest of pink salmon (1,304 fish) was reported in 1987 for the Norton Sound-Seward Peninsula area (Table 4).

Pink salmon are a target species in Norton Sound sport fisheries where harvest estimates have ranged from 1,100 (1985) to more than 13,000 (1982). The recent (1978-1987) ten year average sport harvest is 5,635 fish. Even year harvests for the five years of this period averaged 7,176 fish, while harvests during odd years averaged 2,608 fish. Pink salmon utilize numerous streams in Norton Sound for spawning, and in some years large returns are documented. Extremely large returns have been recorded for the Unalakleet River, the Kwiniuk River and Tubutulik River (Lean et al. 1986). For example more than 6 million pink salmon are estimated to have spawned in the Unalakleet River in 1984 (Lean 1985). Returns of this species are extremely variable even in more southerly latitudes. Cyclic patterns of return abundance are not as pronounced in Norton Sound and in more northerly areas, although the magnitude of return variation is probably larger because of climatic variation. Snow cover, depth, and mean monthly temperatures during the winter months have a profound effect on ice depth and the amount of frozen versus unfrozen ground water in local streams of the area. Salmon egg and fry survival rates are in turn directly affected by the amount of freezing in the stream gravels where incubation takes place.

Non-rearing species such as pink and chum salmon may have an advantage in many of the AYK Area streams where freshwater productivity is much lower than in lower latitudes. Sport and subsistence fisheries in the Nome area for pink salmon in streams such as the Nome, Snake and Sinuk rivers are particularly intense in late July and early August.

Arctic Grayling:

Arctic grayling occur throughout the entire AYK Area and may be the most ubiquitous and highly sought sport fish species in northern, western and interior Alaska. Most of the freshwater drainages that have been surveyed along the arctic coast contain Arctic grayling (USFWS 1982). It is the principal species inhabiting foothill lakes and streams on the Seward Peninsula and they occur in lakes and streams emptying into the Chukchi Sea between Kotzebue and Barrow (ADFG 1978, 1986). Arctic grayling also occur throughout the main stems and tributaries of the largest rivers in the region, including the Yukon, Kuskokwim, Noatak, and Kobuk rivers.

Arctic grayling typically spawn in smaller, clear, headwater streams with gravel bottoms and low stream gradients, during May and early June. After spawning, the adults disperse throughout the streams for summer feeding and rearing. Overwintering occurs in lower stretches of tributaries where sufficient water and oxygen concentrations are present, as well as in lakes

and spring fed portions of streams. Summary descriptions of distribution, life history and abundance of Arctic grayling in the AYK Region are provided in Alaska Habitat Management Guides for the Interior, Western and Arctic Regions (ADFG 1986).

Statewide harvest survey results indicate that since 1977, the Arctic grayling harvest in the AYK Region exclusive of the Tanana Area, has ranged from about 10,000 fish in 1977 to more than 30,000 in 1983, with a harvest of 19,476 in 1987 (Table 2). Since 1983, harvests have declined, and have ranged from 15,500 in 1984 to 19,700 in 1986. The 1987 Arctic grayling harvest was distributed fairly evenly in the five sub-areas of the management area, from 2,000 to 8,000 Arctic grayling in each sub-area (Tables 3 - 7). Large harvests in 1983 took place in the Lower Yukon-Kuskokwim sub-area (9,095), the Seward Peninsula/Norton Sound sub-area (8,241), and in the south slope of the Brooks Range sub-area (6,181) (Mills 1988). The largest sub-area harvest in 1987 (8,317 fish) occurred in the south slope of the Brooks Range sub-area (Table 6).

Northern Pike:

Sloughs, interconnected lakes, and the lower sections of large rivers throughout much of the AYK Area are inhabited by northern pike. Lowland areas of the Yukon and Kuskokwim rivers are particularly noted for large northern pike. Northern pike occur throughout the AYK Area where appropriate habitat is present except the north slope of the Brooks Range, where their distribution is limited. Bendock and Burr (1985) reported the presence of northern pike on the arctic coastal plain west of the Colville River, in rivers and lakes draining into Admiralty and Smith Bays (Figure 21). Northern pike also occur in middle reaches of the Killik River, tributary to the Colville River.

During summer, northern pike are generally distributed near shore in shallow aquatic habitats with aquatic vegetation and a mud bottom. Northern pike have some tolerance for salinity and they are taken frequently in brackish waters of the Yukon-Kuskokwim Delta. They are not known to feed or travel extensively in marine or coastal waters outside the major rivers. During winter, northern pike congregate in deep, well-oxygenated waters found in the lower reaches of tributaries or other areas of sufficient water flow (Hallberg 1984).

The majority of the recreational harvest of northern pike is taken by rod and reel, although some spearing and hand jigging occurs. Productive northern pike fishing takes place in the Kuskokwim River drainage from McGrath downstream to below Bethel, including the Takotna, Nixon Fork, Holitna, and Johnson rivers. Most recreational fishing for northern pike along the Yukon River takes place in the middle and upper reaches, from Galena upstream. Popular areas include the Yukon Flats near Fort Yukon, Koyukuk River, Beaver Creek, Birch Creek, Dall River, Hess Creek, Tozitna River, Melozitna River, and Nowitna River. The Pilgrim River, as well as the Fish-Niukluk system in the Nome area are popular as well.

Table 5. Northwest Alaska^a sport fish harvest and effort by fisheries and species^b, 1987^c.

	Anglers	Trips	Days Fished	KS	SS	RS	CS	LT	DV AC	GR	WF	SF	NP	BB	SM
SALTWATER:															
Boat	101	138	194	0	0	0	11	0	148	0	0	21	0	0	3,371
Shoreline	303	864	739	0	0	0	0	0	0	0	11	792	0	0	0
SALTWATER TOTAL	337 ^d	1,002	933	0	0	0	11	0	148	0	11	813	0	0	3,371
FRESHWATER:															
Noatak River	1,079	1,060	3,313	0	11	0	264	84	844	1,087	148	158	306	11	1,686
Kobuk River	1,011	1,453	4,864	95	0	0	53	53	127	401	53	865	454	0	0
Other Streams	1,010	607	1,010	0	0	21	74	0	401	612	0	0	53	0	0
Lakes	101	59	101	0	0	0	0	22	0	21	0	0	0	0	0
FRESHWATER TOTAL	2,090 ^d	3,179	9,288	95	11	21	391	159	1,372	2,121	201	1,023	813	11	1,686
GRAND TOTAL	2,191 ^d	4,181	10,221	95	11	21	402	159	1,520	2,121	212	1,836	813	11	5,057

^a Northwest Alaska (Area X): Kotzebue area including drainages of Selawik, Kobuk, Noatak, Wulik, and Kivalina Rivers.
All saltwater in the northern half of Kotzebue Sound to and including Point Hope.

^b KS: chinook salmon; SS: coho salmon; RS: red salmon; CS: chum salmon; LT: lake trout;
DV/AC: Dolly Varden or Arctic char; GR: Arctic grayling; WF: whitefish; SF: sheefish; NP: northern pike; BB: burbot; SM: smelt;

^c From Mills 1988

^d Angler totals may not equal sum of sites due to some anglers fishing at more than one site.

Table 6. South Slope Brooks Range^a sport fish harvest and effort by fisheries and species^b, 1987^c.

	Anglers	Trips	Days Fished	KS	SS	CS	LT	DV AC	GR	WF	SF	NP	BB
Haul Road Streams	842	1,565	2,107	0	0	124	0	199	3,713	0	0	25	0
Other Streams	1,044	3,730	2,629	0	25	25	0	99	4,505	74	74	2,079	25
Haul Road Lakes	67	46	67	0	0	0	0	0	25	0	0	0	0
Other Lakes	236	414	397	0	0	0	0	173	74	0	0	50	0
TOTAL	2,023 ^d	5,755	5,200	0	25	149	0	471	8,317	74	74	2,154	25

^a South Slope Brooks Range (Area Y): All drainages south of the Brooks Range and north of the Yukon River; including all northern drainages of the Yukon River from Kaltag to the Canadian Border, and, all drainages of the Koyukuk River and Alatna Rivers.

^b KS: chinook salmon; SS: coho salmon; LL: landlocked coho or chinook salmon; RS: red salmon; PS: pink salmon; CS: chum salmon; LT: lake trout; DV/AC: Dolly Varden or Arctic char; RT: rainbow trout; GR: Arctic grayling; WF: whitefish; SF: sheefish; NP: northern pike; BB: burbot; SM: smelt;

^c From Mills 1988

^d Angler totals may not equal sum of sites due to some anglers fishing at more than one site.

Table 7. North Slope Brooks Range^a sport fish harvest and effort by fisheries and species^b, 1987^c.

	Anglers	Trips	Days Fished	PS	CS	LT	DV AC	GR	WF	NP	BB
SALTWATER:											
Boat	34	46	34	0	0	0	25	0	0	0	0
Shoreline	472	1,197	1,090	0	0	0	322	0	50	0	0
SALTWATER TOTAL	506 ^d	1,243	1,124	0	0	0	347	0	50	0	0
FRESHWATER:											
Haul Road Streams	303	1,060	686	0	0	0	1,263	174	0	0	0
Other Streams	708	921	1,866	0	50	0	892	817	25	0	0
Haul Road Lakes	202	460	668	0	0	50	0	916	0	0	0
Other Lakes	272	414	912	0	0	224	174	25	0	0	0
FRESHWATER TOTAL	1,214 ^d	2,855	4,132	0	50	274	2,329	1,932	25	0	0
GRAND TOTAL	1,551 ^d	4,098	5,256	0	50	274	2,676	1,932	75	0	0

^a North Slope Brooks Range (Area Z): All Alaskan waters, including drainages, north of the Brooks Range and flowing into the Beaufort and Chukchi Seas to the north and east of Point Hope. Does not include Point Hope.

^b PS: pink salmon; CS: chum salmon; LT: lake trout; DV/AC: Dolly Varden or Arctic char; GR: Arctic grayling; WF: whitefish; SF: sheefish; NP: northern pike; BB: burbot; SM: smelt.

^c From Mills 1988

^d Angler totals may not equal sum of sites due to some anglers fishing at more than one site.

Major use of northern pike in the AYK Area is probably for subsistence. Although harvest levels are largely undocumented they are thought to exceed recreational harvests. Much of the subsistence harvest is taken during winter months through the ice with hook and line gear.

Sport fishing for northern pike has gained in popularity since the early 1960's. Northern pike are eagerly sought by fishermen in areas that have good boat access. They are often fished in the fall in combination with hunting activities.

The estimated sport harvest of northern pike in the AYK Area has ranged from about 2,000 fish in 1977 to more than 8,600 fish in 1983 (Mills 1979-1988). The estimated harvest in 1987 was 4,751 fish. The largest harvests until 1986, were consistently taken in the Lower Yukon-Kuskokwim River drainage sub-area. Estimated 1987 harvests from the south slope Brooks Range sub-area were exceptionally strong in 1986 and 1987 compared to prior years, while the estimated catch from the Lower Yukon-Kuskokwim River drainage sub-area was smaller than in past years (Tables 1 - 7).

Little is known concerning the status of northern pike stocks in the AYK Area but because of remoteness and restricted access, fishing effort is thought to be light to moderate except for stocks close to towns and villages that may receive more angling and subsistence gill netting effort. Northern pike populations close to the Yukon River Haul Road Bridge may have experienced more angling pressure because the recent opening of the road has allowed easy boat access to people living in the Fairbanks area. Northern pike population studies conducted in the Tanana River drainage suggest that abundance and stock composition parameters such as age/size respond negatively and rather quickly when annual harvest exploitation rates exceed 15%.

Lake Trout:

Historically, approximately 35% of the total AYK Region harvest of lake trout has occurred in the AYK Area. In 1986, the percentage taken outside the Tanana River drainage was much larger (88%) due to declines in catch and perhaps abundance within the Tanana River drainage. Harvest in 1987 for the entire region totalled 1,113 fish, of which 456 fish (41%) were taken from the AYK Area. Harvest estimates for the AYK Area since 1977 have ranged from about 500 fish in 1977 to about 2,500 in 1986 (Mills 1979-1988). The total region harvest in 1987 is the smallest since 1978.

Recent research indicates that lake trout resources have been overharvested in many of the more accessible waters of south-central and interior Alaska. Specific life history features (slow growth, delayed maturity, and non-consecutive spawning) combined with the shortened growing season at higher latitudes make the species vulnerable to overharvest.

Burr (1987) described the distribution of lake trout in Alaska. Lake trout are most frequently associated with deep, oligotrophic lakes in the mountains and are rarely found at lower elevations of the Yukon or Kuskokwim basins (Redick 1967; Morrow 1980). In northwest Alaska, lake trout occur in lakes and streams of the Brooks Range in the Noatak and Kobuk River drainages. Lake

trout are found in most drainages that flow into the Yukon River from the Brooks Range. Lake trout distribution is primarily restricted to lakes at higher elevations in these drainages. Lake trout are widely distributed on the north slope of the Brooks Range. They occur most frequently in mountain and foothill lakes, but they also occur in streams of the Colville, Sagavanirktok, and Canning River drainages. Lake trout generally do not occur in the lowland lakes of the arctic coastal plain, but they occur commonly in central coastal plain lakes between the Ikpiuk and Colville rivers.

The Department of Fish and Game has conducted little population research on this species in areas outside of the Alaska Range area in the Tanana Valley and near Glennallen. Lake trout research is being conducted by federal agencies, such as USFWS, NPS (National Park Service), and BLM (Bureau of Land Management) in National Wildlife Refuges, National Parks, National Preserves and other unclassified lands.

Dolly Varden/Arctic Char:

The majority of the harvest of Arctic char or Dolly Varden (collectively referred to as char in this section) in the region occurs in the AYK Area since only the dwarf stream resident form is found in the upper Yukon and Tanana River systems. Char occur in most of the waters of western and arctic Alaska, either in the anadromous, river resident, lake resident, or stream dwarf forms. Char are a target species for subsistence and sport fisheries in waters of the Arctic, Kotzebue vicinity, Seward Peninsula, and Norton Sound.

Two species are recognized within the AYK Area based upon meristic characters, (gill raker and pyloric caeca counts), life history features and the occurrence of anadromy (Behnke 1980). Dolly Varden are the dominant species from Bristol Bay north to the arctic plain, and they occur in either the anadromous, stream resident or stream dwarf form, while the Arctic char occurs only as a lake resident form in foothills of the North Slope (Chandler Lake Campsite Lakes, etc. Figure 22), the Kobuk River drainage (Walker and Selby lakes Figure 15), the Seward Peninsula (lakes of the Kigluaik Mountains Figure 12), and the Kuskokwim Mountains (Aniak, Kisaralik, Kagati, and Goodnews lakes Figure 9). The majority of char in the AYK Area are Dolly Varden of either the stream resident or anadromous type. They occur throughout the area but are most abundant in tributaries of the lower Yukon and Kuskokwim rivers, Norton Sound, Northwest Alaska, and along the north slope of the Brooks Range and the arctic plain. Morrow (1980) distinguishes two distinct forms of Alaska Dolly Varden (*S. malma*) based upon gill raker and vertebral counts. Generally the southern form occurs only south of the Alaska Range, however examination of specimens collected in the upper reaches of the Copper, Tanana, Nenana, and Susitna Rivers indicates the presence of southern and northern forms on both sides of the passes in the stream resident or stream dwarf forms. Morrow (1980) argues that headwater transfer, which may still be occurring, is responsible for the mixing of the southern and northern forms in these areas.

Sport harvests of char from 1977 to 1987 have ranged from approximately 4,000 fish to more than 20,000 fish in the AYK Area. This represents less than 5% to about 20% of the statewide total harvest (Mills 1979-1988). Typically, the

largest percentage (approximately 50% of the region total) of the harvest is taken in the Seward Peninsula-Norton Sound sub-area. High quality sport fishing for char is available in northwest Alaska, particularly in the Wulik and Kivalina rivers north of Kotzebue, where trophy Dolly Varden move into the stream for either overwintering or spawning in the fall. The Noatak River in northwest Alaska supports populations of spawning Dolly Varden char in its tributaries. Important spawning tributaries include the Kelly River and several of its branches, Koguruk River and several branches, and the Nimiuktuk River and its branches (Alt 1981a). Incidental commercial harvest as well as directed subsistence harvests account for the highest proportion of the annual fishing mortality in northwest Alaska in most years (Bernard and DeCicco 1987).

Burbot:

Burbot are distributed throughout the AYK Area in all major rivers and many of the lakes and minor waterways. It is an important fisheries resource for both the subsistence economy in rural Alaska and for sport fisheries throughout the area. Burbot are members of the cod family, *Gadidae*, and spawn in midwinter under the ice of rivers and lakes. Sport fishing interest and intensity has increased for the species in recent years, particularly near settlements where burbot fishing provides an outdoor wintertime activity for many people. Reported annual sport harvests of burbot in the AYK Area since 1977 have ranged from just over 100 fish to approximately 2,000 (Mills 1979-1988). The majority of the harvest effort occurs in the winter with lines set through the ice, although hand held lines and rod and reel are also used in summer and winter months. The majority of the burbot sport harvest in the AYK Region occurs in the Tanana River drainage. Less than 200 fish of the 4,000 total burbot taken in 1987, were taken from areas outside the Tanana River drainage.

Whitefish:

Although members of the whitefish family, *Coregonidae*, are seldom considered to have substantial recreational value, as a group they constitute an extremely important fisheries resource in the AYK Area. They are taken year around by subsistence fisheries and are utilized for bait and human consumption as well as for dog food. In addition, various whitefish species form a forage base for many of the predatory fishes such as northern pike, burbot, and sheefish. The most important species in northern, western, and interior Alaska include the humpback whitefish, broad whitefish, round whitefish, Arctic cisco, least cisco, and Bering cisco.

Recreational fisheries throughout the area account for a very small proportion of the total harvest of all species of whitefish. The magnitude of the subsistence harvest is not well documented, but is believed to be substantial. In some areas where salmon are not available, the whitefish harvest is the major source of fish for subsistence use. Such a situation prevails over the entire North Slope, and in many of the remote villages of interior Alaska located beyond the extent of the majority of the salmon runs. Limited commercial fisheries for whitefish exist in the AYK Area. Further discussion of these is found in the Land Use, Habitat and Water Quality section.

Sheefish:

Sheefish (or Inconnu), are large, predatory whitefish found throughout western, interior, and northwestern Alaska. They do not occur in north slope streams nor in Norton Sound north of the Koyuk River. Alt (1987) identified nine stocks of sheefish, with anadromous-estuarine stocks occurring in the Kuskokwim, Lower Yukon, Koyuk, Kobuk-Selawik rivers, and resident non-anadromous stocks in Yukon River tributaries of the Nowitna, Tanana River (Minto Flats), Porcupine, and Salmon Fork of the Black River, as well as the main stem of the upper Yukon River. The distribution of this species in Alaska is limited to the AYK Region.

Sheefish are harvested by subsistence, commercial, and recreational users with subsistence harvests exceeding all others. The major commercial fishery (Kotzebue Sound) is limited by a harvest quota of 11,350 kg or approximately 3,300 fish annually (Lean 1985). Reported sales of sheefish from this commercial fishery have only once (in 1977-78) reached the allowed quota (Lean et al. 1986). During the period from 1977-1987, the recreational harvest in the AYK Region ranged from about 1,250 to about 3,950 fish (Table 2). Kobuk and Selawik River sheefish are the most abundant and heavily fished stocks. Harvest occurs on a year-round basis in subsistence, commercial and sport fisheries, from spawning grounds in the upper Kobuk River to Kotzebue and Selawik located on the large brackish inlets, Hotham Inlet and Selawik Lake. The data base for sheefish stocks of the Kobuk and Selawik Rivers is not adequate to allow the determination of sustainable yields for the stocks. The size of the spawning stocks has been poorly documented in the past 20 years, as has the harvest and biological composition of the harvest. Because of the late sexual maturation (five to seven years) of the species, suspected non-consecutive spawning, and probable decrease in average adult size in the past 20 years, there is concern that the stocks may be experiencing harvests beyond sustainable levels. The question cannot be addressed until further biological information becomes available.

Sheefish generally overwinter in lower reaches of rivers and estuarine waters, migrate upstream in summer to feeding grounds, and migrate further upstream to spawning grounds in the late summer and fall. Migrations of over 1,650 km have been documented. Sheefish spawn in late September and early October at water temperatures of 0 - 5°C. Numbers of spawners have been estimated to range from 100 in the Chatanika River to 3,700 in the Kobuk River (Alt 1987a). Spawning grounds have probably been identified for all major sheefish stocks. Availability of spawning habitat with desired current (2 m per sec), water depth (2 m), and bottom substrate of differentially-sized gravels may be the most critical factor limiting sheefish distribution and abundance (Alt 1987a).

STAFF ORGANIZATION

Regional Staff Responsibilities

Region staffing responsibilities during 1987 are outlined in the staffing flow chart (Figure 24). All activities were supervised under the overall direction of the Regional Supervisor (J. Clark) who delegated appropriate tasks to the

ORGANIZATIONAL CHART FOR A-Y-K REGION OF SPORT FISH DIVISION, 1987

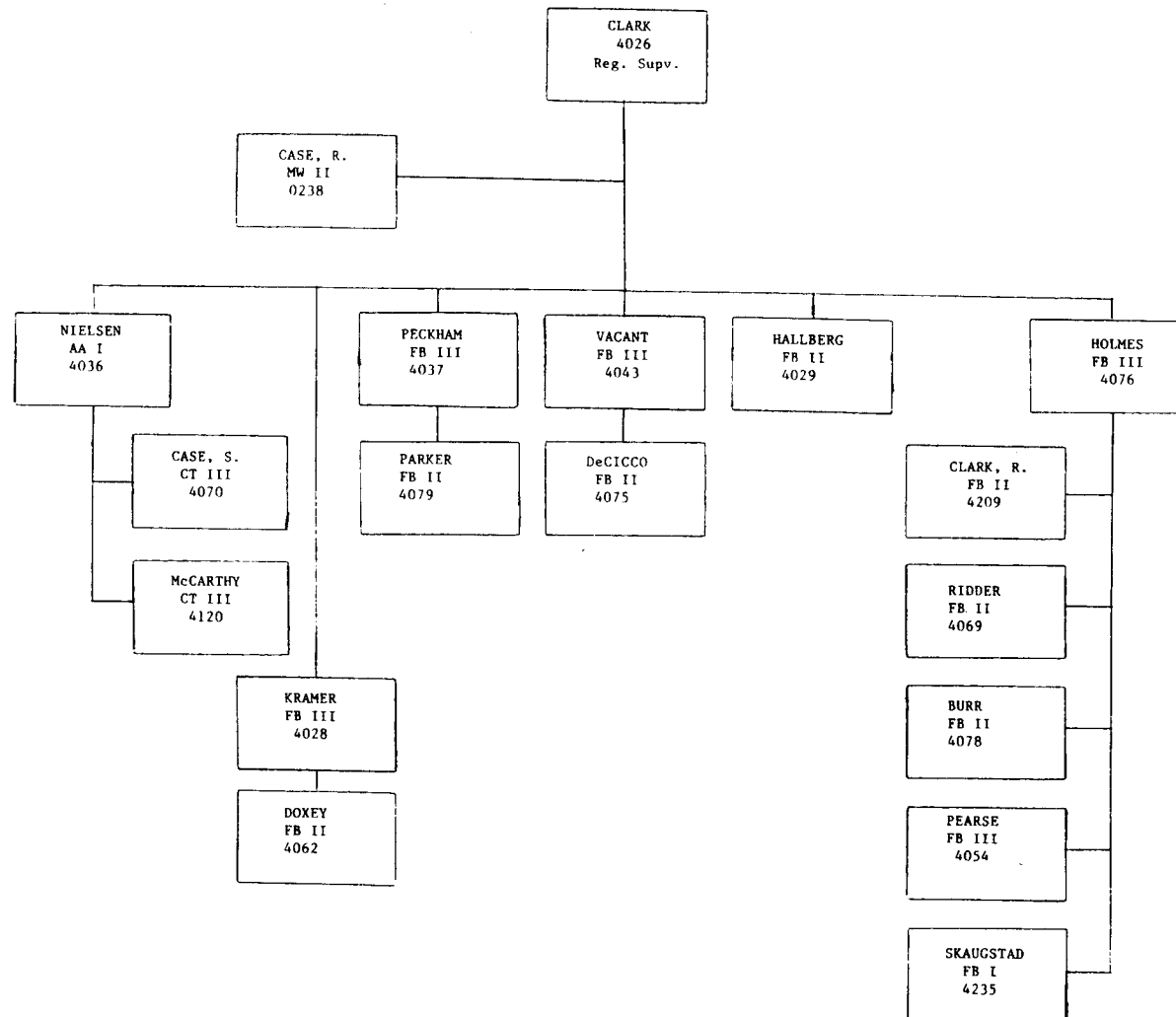


Figure 24. Organizational chart for A-Y-K Sport Fish staff, 1987.

Administrative Assistant (E. Nielsen), the Research Supervisor (R. Holmes) and the following Fishery Biologist III's: R. Peckham (retired 9/87), K. Alt (retired 6/87), W. Arvey (hired to replace Alt) and M. Kramer. Lake stocking and enhancement activities were the responsibility of M. Doxey and C. Skaugstad. Area management responsibility and emergency order authority was vested with three positions, K. Alt (AYK Area), R. Peckham (Upper Tanana River Area), and J. Hallberg (Lower Tanana River Area). Each of the area managers was also responsible for implementing various fishery projects in the respective areas. The AYK Area biologist was responsible for char and sheefish projects, the Upper Tanana River Area biologist for northern pike and burbot research projects, and the Lower Tanana River biologist for burbot and whitefish projects. Research was conducted by W. Ridder on Arctic grayling in Shaw Creek, the Delta Clearwater River, Richardson Clearwater River, Goodpaster River, Fielding Lake, and Tangle lakes, all in the upper Tanana Valley. Arctic grayling research in the Salcha and Chena rivers near Fairbanks was conducted by R. Clark. Emphasis for research was placed on the high-use Arctic grayling fisheries near Fairbanks, the principal urban center. T. Baker supervised creel census studies. Char research was conducted in northwest Alaska by A. DeCicco. Lake trout research in the Tanana River drainage was conducted by J. Burr. Burbot research in lakes of the upper Tanana Valley was conducted by F. Parker. M. Evenson summarized river burbot studies. A. Burkholder summarized Minto Flats northern pike research. S. Gregory and G. Pearse summarized lake research conducted on northern pike. Fisheries information and education were the duties of M. Kramer.

Synopsis of Major Sport Fisheries Research in 1987

The intent of the following section is to provide a brief overview of AYK Region fisheries reports and studies completed during the reporting year. Since virtually all activities are documented with either Federal Aid reports, journal publications, reports to the Alaska Board of Fisheries, or a combination of these following each field season, the reports themselves are cited, followed by a brief synopsis.

Baker, T. T. 1988. Creel censuses in interior Alaska in 1987. Alaska Department of Fish and Game. Fishery Data Series No. 64. 138 pp.

Angler effort, catch-per-unit-effort (CPUE), harvest-per-unit-effort (HPUE), catch, and harvest were estimated for seven fisheries, and CPUE and HPUE were estimated for seven other fisheries. Eleven fisheries within the Tanana River, two within the Gulkana River drainage, and one within the Nenana River drainage were censused. Age composition, mean length-at-age, and relative stock density were estimated for the major species encountered at each fishery.

Burr, J. M. 1988. Stock assessment and biological characteristics of lake trout populations in interior Alaska, 1987. Alaska Department of Fish and Game. Fishery Data Series No. 66. 53 pp.

Results of stock assessment of lake trout in lakes of the Upper Copper and Tanana rivers is presented. Relatively larger lake trout were found in Paxson and Summit lakes than in lakes of the Tanana River drainage. Population

abundance was estimated in three lakes of the Tanana River drainage. The density of lake trout of mature size was estimated to be 12.4 fish per ha in Sevenmile Lake, 9.7 fish per ha in Twobit Lake, and 7.5 fish per ha in Landlocked Tangle Lake.

Clark, J. H. 1988. Abundance and life history features of the T Lake northern pike population during 1986 and 1987. Alaska Department of Fish and Game Fishery Data Series No. 47. 44 pp.

The northern pike population in T Lake, near Dot Lake, Alaska, was assessed in 1986 and 1987 for abundance, mortality, recruitment, age composition, length composition and growth. Annual estimates of abundance from mark-recapture experiments were 454 and 516 northern pike over 450 mm in fork length in 1986 and 1987, respectively. Sport fishery harvests between 1986 and 1987 were sustainable.

Clark, J. H., D. R. Bernard, and G. A. Pearse 1988. Abundance of the George Lake northern pike population in 1987 and various life history features of the population since 1972. Alaska Department of Fish and Game. Fishery Data Series No. 58. 49 pp.

Abundance of northern pike over 299 mm fork length (mm FL) was estimated to be 17,662 fish (SE = 2,105 fish), and density was estimated to be 9.69 fish per ha. The age 4 cohort was most abundant, comprising an estimated 31% of all northern pike greater than 299 mm. Current estimated rates of sport fishery exploitation (14% - 23%) may not be sustainable.

Clark, J. H. and L. S. Gregory. 1988. Abundance estimates of the Volkmar Lake northern pike population with estimates of age, sex, and length composition, 1985 through 1987. Alaska Department of Fish and Game. Fishery Data Series No. 57. 47 pp.

The abundance of northern pike over 299 mm FL in Volkmar Lake, northeast of Delta Junction, Alaska in May 1987 was estimated to be 6,998 fish, with a density of 25.6 fish per ha. Abundance estimates by size class were: 5,130 fish in the 300-549 mm class, 1,386 fish in the 550-649 mm class, and 482 fish larger than 650 mm. Abundance of northern pike larger than 299 mm decreased between 1986 and 1987 by approximately 1,000 fish.

Clark, R. A. 1987. Arctic grayling harvests, stock status, and regulatory concerns in the Arctic Yukon Kuskokwim region. A report to the Alaska Board of Fisheries, Anchorage Alaska, December, 1987. Alaska Department of Fish and Game, Fairbanks.

Status of stocks in the Tanana River drainage and in the AYK Area is presented and discussed in relation to regulatory proposals. Declines of some stocks are discussed as are suggested rebuilding scenarios. Harvest statistics for major Tanana River drainage stocks are presented.

Clark, R. A. 1987. Sources of variability in three aging structures for Yukon River fall chum salmon (*Oncorhynchus keta* Walbaum) escapement samples. Proceedings of the 1987 Northeast Pacific pink and chum salmon workshop, Anchorage, Alaska February 18-20, 1987. Edited by P. Rigby, Alaska Department of Fish and Game, Juneau AK.

Scales, otoliths and vertebrae were taken from escapement samples in the Delta and Toklat rivers in 1985 to quantify sources of variability for utility of age determination with these structures. Comparisons of age estimates from scales and vertebrae are more precise than estimates from otoliths, as determined with an index of average percent error. Vertebrae tended to represent ages as older than age determination from scales. The presumed reason for the disparity in ages between the two structures is that scales tend to erode or be reabsorbed as migration to the spawning site proceeds while vertebrae do not.

Clark, R. A. and W. P. Ridder 1988. Stock assessment of Arctic grayling in the Tanana River drainage. Alaska Department of Fish and Game. Fishery Data Series No. 54. 79 pp.

Population size in the Chena River was 31,502 Arctic grayling greater than 149 mm; 16,097 greater than 199 mm in Fielding Lake; 2,775 greater than 249 mm in the Richardson Clearwater River; and 10,520 greater than 289 mm in Shaw Creek. Relative abundance was estimated in the Delta Clearwater and Richardson Clearwater rivers, and population size was estimated in two 4.8 km sections of the lower Goodpaster River. Age and size composition estimates were obtained from all systems (nine) surveyed. Age 4 and 7 fish were strongly represented in most systems studied, indicating that similar patterns of recruitment occur throughout the Tanana drainage. Growth rate appears highly variable between systems.

Doxey, M. 1988. Evaluation of stocked waters in the Tanana drainage, 1987. Alaska Department of Fish and Game. Fishery Data Series No. 73. 53pp.

In 1987, a total of 80 lakes and ponds in interior Alaska were stocked with more than 3 million fish of six different game species. It was estimated with mark-recapture studies that an estimated 55% and 14%, of subcatchable rainbow trout survived from the time of stocking in June 1987 to August 1987 in Birch and Quartz lakes respectively. Overwinter survival rates of rainbow trout fingerling ranged from 14% to 83% in a series of smaller lakes. Chinook salmon survival rates in two small lakes were estimated at 32% and 30%. Results indicated that rainbow trout stocked in Piledriver Slough survived the winter of 1987-1988.

Evenson, M. J. 1988. Movement, abundance and length composition of Tanana River burbot stocks during 1987. Alaska Department of Fish and Game. Fishery Data Series No. 56. 42 pp.

A total of 8,399 burbot greater than 299 mm were tagged and released from 1983-1987. During 1987, 4,516 burbot were captured in 13 sample sections. Movement information indicates the possibility that at least three stocks of burbot inhabit the main stem of the Tanana River. Population abundance

estimates were performed in two sections of the Tanana River (Rosie Creek and Healy Lake) each 16 km in length. The combined total of large and small burbot for each section was 3,303 and 6,038 for the two respective sections of the river.

Hallberg, J. E. and T. T. Baker. 1987. Whitefish stock status in the Tanana drainage and the recreational spear fishery with a regulatory recommendation. A report to the Alaska Board of Fisheries, Anchorage Alaska, December, 1987. Alaska Department of Fish and Game, Division of Sport Fish, Fairbanks.

The spear fishery on the Chatanika River is reviewed, with harvest and effort statistics and a summary of Department research to date. Regulatory proposals for the 1987 Board of Fisheries meeting are discussed.

Hallberg, J. E. 1988. Abundance and size composition of Chatanika River least cisco and humpback whitefish with estimates of exploitation by recreational fishermen. Alaska Department of Fish and Game. Fishery Data Series No.61 33 pp.

Returns of 83,785 and 90,165 combined least cisco and humpback whitefish were estimated from mark-recapture and expanded tower counts respectively. Approximately two-thirds of the total in each case was estimated to be least cisco. The estimated rate of exploitation of least cisco by the recreational spear fishery in 1987 was 0.427 using mark-recapture abundance estimates and 0.376 using expanded tower count estimates of abundance. Comparable exploitation rate estimates for humpback whitefish were 0.163 and 0.170 respectively.

Holmes, R. A. 1987. Profiles and regulatory preferences of Tanana River Drainage sport fishermen. Alaska Department of Fish and Game, Fishery Manuscript No. 2 44 pp.

Motives for fishing, angler descriptions, and angler preferences for a variety of fishery management and regulation options were evaluated using a postal questionnaire. Differences in use patterns and regulation preferences were found between anglers grouped as sport, food, and nonsuccess-motivated. Sport-motivated anglers fished more often and preferred length limits and catch and release regulations more than food and nonsuccess-motivated fishermen. Food-motivated anglers were more often rural residents and disapproved of bag limit reductions and catch and release areas and approved of stocking fish more often than sport and nonsuccess-motivated anglers. Nonsuccess-motivated fishermen approved of bag limit reductions more frequently than sport and food-motivated fishermen.

Holmes, R. A. and G. A. Pearse. 1987. Northern pike stock status and regulatory concerns in the Arctic Yukon Kuskokwim region. A report to the Alaska Board of Fisheries, Anchorage, Alaska, December, 1987. Alaska Department of Fish and Game, Division of Sport Fish, Fairbanks.

Studies demonstrated that liberal bag and possession limits for northern pike in the Tanana River drainage were ineffective in protecting abundance and size

structure of stocks where relatively high level fisheries occur. Regulations proposed by the Department to protect the most vulnerable stocks are discussed.

Holmes, R. A. and A. Burkholder. 1988. Movements and stock composition of northern pike in Minto Flats. Alaska Department of Fish and Game. Fishery Data Series No. 53. 34 pp.

Over 2,000 northern pike were sampled from the population in Minto Flats in 1987 for age, sex and length, and all fish over 300 mm FL were tagged. Movements of 98 northern pike implanted with radio transmitters were monitored. Length at age and maximum age of northern pike sampled from Minto Flats were higher than those of northern pike populations sampled from lakes of interior Alaska.

Krasnowski, P., J. H. Clark, D. McBride, and R. A. Holmes. 1987. An overview of regulatory proposals for recreational fisheries in the Kodiak, Alaska Peninsula, Bristol Bay, and Arctic-Yukon-Kuskokwim Areas. A report to the Alaska Board of Fisheries, Anchorage Alaska, December, 1987. Alaska Department of Fish and Game, Division of Sport Fish, Anchorage and Fairbanks.

A summary is presented of conservation concerns for the sport fisheries in southcentral, western and interior Alaska, with stock status accounts for critical species and stocks. Regulatory proposals for consideration at the 1987 Board of Fisheries meeting are discussed.

Parker, J. F., W. D. Potterville, and D. R. Bernard. 1988. Stock assessment and biological characteristics of burbot in lakes of interior Alaska during 1987. Alaska Department of Fish and Game. Fishery Data Series No. 65. 86 pp.

Abundance was monitored for 24 lake resident populations of burbot in interior Alaska. Abundance of fully recruited (> 450 mm) burbot was greatest in Lake Louise (5,251), Hudson (3,761), Crosswind (3,651), and Paxson (3,246) lakes. Survival between years ranged from 46 to 62 % per year for populations in Paxson, Fielding, Louise, and Tolsona lakes.

Sharp, D. and D. R. Bernard. 1988. Precision of estimated ages of lake trout from five calcified structures. North American Journal of Fisheries Management. Volume 8 pp 367-372.

Precision of ages from vertebrae, cleithra, opercular bones, otoliths and scales were measured in replicated trials on samples from lake trout from interior Alaska. Ages from all structures were similar for sexually immature lake trout. For mature lake trout, estimated ages from otoliths and from opercular bones were the most precise, although ages from opercular bones were significantly younger by a year than ages from otoliths. Estimated ages from cleithra and whole vertebrae were respectively, too imprecise and too low for these structures to be useful in age validation studies. On this basis, otoliths and opercular bones can be used in age validation studies and scales can be used to estimate the age of immature lake trout.

Skaugstad, C. 1988. Evaluation of Arctic grayling enhancement in Alaska during 1987. Alaska Department of Fish and Game. Fishery Data Series No. 48. 21 pp.

The project attempted to determine the optimum weight at which to stock age 0 Arctic grayling based on cost per survivor at age 1. The cost per survivor was lower for stocked fingerling than for stocked sac fry in 11 of the 13 study sites. No significant difference between stocking time among rearing methods was noted when the number of grayling stocked was compared to the number of grayling captured. However there were significant differences between rearing methods. Overall, pond reared grayling stocked in either August or September had the best survival rates.

Skaugstad, C. 1988. Abundance and age-sex-size composition of the 1987 Salcha River chinook salmon escapement. Alaska Department of Fish and Game. Fishery Data Series No. 37. 25 pp.

The 1987 spawning escapement in the Salcha River was estimated to be 4,771 chinook salmon of both sexes, and included 2,481 females and 2,290 males. Aerial survey abundance estimates counted 40% of the mark-recapture estimate.

AREA FISHERY REPORT

Harvest and Effort in 1987

The sources of harvest information for AYK Region sport fisheries, include the "Alaska Statewide Sport Fisheries Harvest Report" (Mills 1988) and/or creel census studies on specific fisheries, conducted by area personnel (summarized by Baker 1988).

Creel census information in 1987 provided estimates of catch, effort, CPUE as well as age and size composition of the catch (Baker 1988). Some creel census studies solicited angler opinions concerning fishing quality, or choice of regulatory and management options being considered for a particular fishery. The creel census program was designed to monitor both the fishery and the fish populations, aid in the development of regulations that insure sustained yield, and assess the effect of regulations on the fishery and fish stocks. A summary of the estimated harvest, HPUE, total effort, and dates of the creel census by water body appears in Table 8.

The 1987 sport harvest estimates in two of the largest fisheries in the Tanana drainage (upper Chena River, and the Delta Clearwater River) were 1,260 and 1,838 Arctic grayling, respectively. The record low harvest for the Chena River was partly due to more restrictive regulations, implemented in the spring of 1987. They included a spring fishing closure on Arctic grayling, a bait restriction, and a 305 mm (12 in) minimum length on all Arctic grayling caught and retained. Identical regulations were also in effect on the Delta Clearwater River where the 1987 harvest (1,838 fish) was slightly larger than that (1,701 fish) estimated in 1986. Catch and harvest statistics were calculated in 1987 for Arctic grayling fisheries that take place in the Chena

Table 8. AYK Region creel surveys, 1987.

Water Body/Fishery	Species ^a	Date(s)	Effort (hours)	CPUE ^b	Harvest
Chatanika River	GR	18 May-30 Jun	ND	0.21	ND
Chatanika River campground	LC	11 Sept-18 Oct	3,849	4.14	15,931
Chatanika River ditch area	LC	11 Sept-18 Oct	ND	ND	7,804 ^c
Chatanika River campground	HW	11 Sept-18 Oct	3,849	0.80	3,072
Chatanika River ditch area	HW	11 Sept-18 Oct	ND	ND	1,505 ^c
Chatanika River	RW	11 Sept-18 Oct	3,849	0.05	187
Chena River	GR	18 May-15 Sept	9,090	0.78	1,260
Chena River	CS	01 Jul-17 Jul	ND	0.00	0
Chena River	KS	01 Jul-17 Jul	ND	0.22	ND
Delta Clearwater River	GR	06 Jun-07 Sept	4,476	1.10	1,838
Fielding Lake	LT	15 Jun-31 Aug	839	0.10	62
Fielding Lake ^d	GR	15 Jun-31 Aug	1,627	ND	1,078
Paxson Lake	LT	15 Jun-31 Aug	ND	0.25	ND
Piledriver Slough	RT	25 Apr-31 Aug	ND	1.55	ND
Piledriver Slough	GR	25 Apr-31 Aug	ND	0.95	ND
Quartz Lake	SS ^e	01 May-31 Aug	35,670	1.15	18,665
Quartz Lake	RT	01 May-31 Aug	35,670	0.28	5,738
Salcha River	GR	15 May-31 Aug	ND	1.27	ND
Salcha River	KS	01 Jul-28 Jul	8,017	0.17	111
Salcha River	CS	01 Jul-28 Jul	8,017	0.37	120
Summit Lake	LT	15 Jun-31 Aug	ND	0.25	ND
Tangle Lakes and River	GR	15 Jun-31 Aug	4,129	2.56	1,679
Wood Creek	SS ^f	25 Sept-12 Oct	522	0.53	195

^a BB: burbot; CS: chum salmon; GR: Arctic grayling; HW: Humpback whitefish; KS: chinook salmon; LC: least cisco; LT: lake trout; RT: rainbow trout; RW: round whitefish; SS: coho salmon

^b Harvest per unit effort

^c Ditch harvest is a direct expansion of the campground harvest estimate based upon the ratio of cars at the campground and ditch areas.

^d Combined data for Fielding Lake and Fielding Lake outlet

^e Landlocked coho salmon

^f Anadromous coho salmon

River, Delta Clearwater River, Fielding Lake and the Tangle lakes. Results indicated that catch-and-release is practiced more extensively than previously thought. For example, in the Tangle lakes system alone, 10,581 Arctic grayling were caught while only 1,679 (16%) were actually harvested in 1987. In Fielding Lake, 56% of all Arctic grayling caught were retained.

The estimated harvest of coho salmon in Quartz Lake was approximately 19,000 fish in 1987, compared to only 8,000 fish in 1986 (Table 8). HPUE for the census period in 1987 was estimated at 1.15 coho salmon per hour compared to 0.29 fish per hour in 1986.

Estimated harvest and effort for both least cisco and humpback whitefish in the Chatanika River fall spear fishery was greater in 1987 than in 1986. However the HPUE was reduced in 1987.

The 1987 Salcha River chinook salmon harvest of 111 fish was below average, and much less than in 1986 (526 fish). Chinook salmon entered the Salcha River at the normal time in early July, however as the migration proceeded it was apparent that run timing in 1987 was much later than normal. Normal migration timing would place the peak of spawner abundance at around the third week of July. Aerial surveys conducted in late July indicated that minimum spawning escapement had not been achieved. The salmon sport fishery was closed by emergency order on July 28, 1987. The minimum escapement goal (1,500 chinook salmon on an aerial survey) was attained on August 4 and the emergency fishery closure was rescinded on August 12.

The statewide postal survey, compiled annually since 1977 by Mills (1979-1988) serves as the basic reference of effort and harvest in AYK Region fisheries. Approximately 4% of all sport fishing license holders and their households are surveyed annually for the harvest survey, and in 1987 a total of 13,357 questionnaires were mailed, followed by two reminders to non-respondents. Many important Tanana drainage fisheries have not received monitoring effort by Department creel censuses, and several fisheries are currently monitored only on a cursory basis whereby CPUE and biological catch composition data are collected, but not seasonal harvest totals. In cases where creel censuses are incomplete or not done at all, the statewide survey is the only source of information. It is also instructive to compare harvest estimates derived from creel censuses, where available, with those from the statewide survey, as in Table 9. Fisheries within the Tanana Area for which data from both the statewide harvest report and regional creel census are available, yield estimates of harvest that are similar (Table 9).

Results of the 1987 harvest report for the Tanana River drainage fisheries are based on a total of 1,364 respondents (Mills 1988). In 1987, Tanana Area anglers accounted for 79% and 10% of the total number of all anglers in the AYK Region and the entire state of Alaska, respectively (Table 10). Of the 1,416,000 fish harvested in freshwater (includes anadromous salmonids) in the state, 140,000 (10%) were taken from the Tanana drainage, and 62,000 (4%) were taken from the AYK Area excluding the Tanana Area (Table 10).

Table 9. Comparison of 1987 Alaska Sport Fish Survey and Tanana River drainage creel census harvest estimates.

Fishery	Creel survey	Harvest survey ^a
Upper Chena River		
Arctic grayling	1,260	1,461
Delta Clearwater River		
Arctic grayling	1,838	2,005
Chatanika River		
whitefish	28,312	25,074
Fielding Lake		
Arctic grayling	1,078	910
lake trout	62	127
Salcha River		
chinook salmon	111	244
chum salmon	120	132
Quartz lake		
landlocked coho salmon	18,665	15,449
rainbow trout	5,738	10,106

^a Statewide sport fish harvest survey (Mills 1988).

Table 10. Number of sport anglers, fishing trips, angler days and total freshwater^a fish harvested in the Tanana River drainage, AYK Region and the entire state of Alaska, 1987^b.

	Tanana Drainage	AYK Region ^c	Alaska
Number Sport Anglers	35,834	45,542	370,338
Number Fishing Trips	142,116	171,883	1,713,829
Number Angler Days	156,061	217,109	2,152,886
Total Fish Harvested	139,907	201,677	1,415,901

^a Includes anadromous salmonids.

^b Mills 1988.

^c Inclusive of Tanana River drainage.

MANAGEMENT ACTIVITIES

1987 In-Season Regulatory Measures

Fisheries studies initiated in 1984 and 1985 identified a number of conservation problems requiring attention through the regulatory process. Substantial changes in AYK Region sport fisheries regulations were thereby initiated in 1986 as a result of those studies. Lake trout, Arctic grayling and lake burbot populations in the Tanana Area were the subject of many of the new regulations.

Emergency Orders:

The Alaska State Legislature, in enacting AS 16.05.060, delegated to the Commissioner and his authorized designee the power to control certain aspects of public utilization of fish and game. Statutory authority for emergency orders is limited to changes in time and area regulations only, so that seasons or areas may be opened or closed and weekly closed periods may be changed. Emergency orders may not be used to establish or change quotas, bag limits, size limits or gear restrictions, among other things. Emergency orders have the same force and effect as regulations of the Boards of Fisheries and Game, or statutes enacted by the Legislature, and they carry the same criminal penalties if violated. Issuance of emergency orders during the fishing season may be thought of as a fine tuning process in implementing a general management plan already approved by the Alaska Board of Fisheries. Sport fisheries in the AYK Region generally proceed under the published basic regulations.

A number of regulatory changes were enacted during the 1987 calendar year. The 1986 Alaska Board of Fisheries meeting was scheduled for the fall of 1986, at which time proposals affecting 1987 sport fisheries in the AYK Region were to be considered. A series of staff proposals had been developed to address the more serious conservation problems identified over the past two years. Those proposals were not considered due to an unexpected early adjournment of the meeting. In order to have needed regulatory changes in place by the spring of 1987, the ADFG staff enacted a series of emergency orders and emergency regulations pursuant to the State of Alaska Administrative Procedures Act³. Because of the limitation on emergency order authority of regional and area fisheries managers to issuing emergency changes in seasons and area closures only, emergency regulations were required to effect needed changes in bag limits to reduce harvests to more acceptable limits.

Following the summer season of 1987, many of the measures enacted by emergency order and emergency regulation were brought again to the fall meeting of the Alaska Board of Fisheries for consideration by that regulatory body as permanent regulatory changes.

The following emergency orders and emergency regulations were issued in 1987:

³ Alaska Statute 44.62.180(3)

1. 3-LT,BB-01-87. Closed the Tangle lakes system to the taking of lake trout and burbot from January 1 through December 31, 1987. Issued at Fairbanks, January 1, 1987.
2. 3-LT,BB-02-87. Closed Fielding Lake to the taking of lake trout and burbot from January 1 through May 15, 1987. Issued at Fairbanks, January 1, 1987.
3. 3-LT-06-87 Reopened Fielding Lake to the taking of lake trout on February 9, 1987. Issued at Fairbanks, February 9, 1987.
4. 3-BB-07-87 Amended the expiration date of Emergency Order No. 3-LT,BB-02-87. Specifically, Fielding Lake, previously closed to the taking of burbot, was re-opened effective 12:01 a.m. April 1, 1987.
5. 3-BB-03-87. Closed "T" Lake to the taking of burbot from January 1 through December 31, 1987. Issued at Fairbanks, January 1, 1987.
6. 3-BB-04-87. Closed Harding Lake to the taking of burbot from January 1 through December 31, 1987. Issued at Fairbanks, January 1, 1987.
7. 3-NP-05-87 Closed Minto Flats to the taking of northern pike from February 6, through May 31, 1987. Issued at Fairbanks, February 6, 1987.
8. 3-G-08-87. Closed Shaw Creek and a portion of the Tanana River above and below the mouth of Shaw Creek to all sport fishing from April 3, through June 5, 1987. The purpose of the closure was to protect Arctic grayling. Issued at Delta Junction, April 3, 1987.
9. 3-G-12-87. Rescinded Emergency Order No. 3-G-08-87 which closed Shaw creek to all sport fishing because emergency regulations effective April 16, addressed the conservation problem. Issued at Fairbanks, April 27, 1987; effective April 28, 1987.
10. 3-G-9-87. Closed the Chena River Drainage (including Badger Slough) to the taking of Arctic grayling from April 15, through June 5, 1987. Issued at Fairbanks, April 14, 1987.
11. 3-G-10-87. Closed the Delta Clearwater River drainage to the taking of Arctic grayling from April 15 through June 5, 1987. Issued at Fairbanks, April 14, 1987.
12. 3-G-11-87. Closed the Richardson Clearwater River drainage to the taking of Arctic grayling from April 15 through June 5, 1987. Issued at Fairbanks, April 14, 1987.
13. 3-KS,CS-13-87. Closed the Salcha River to the taking of salmon from July 29 through August 31 based on low escapements seen to date. Issued at Fairbanks, July 28, 1987.

14. 3-KS,CS-14-87. Rescinded previous Emergency Order No. 3-KS,CS-13-87 effective August 13, 1987. Salmon fishing on the Salcha River was re-opened based on new escapement information. Issued at Fairbanks, August 12, 1987.
15. 3-Z-13-87. Closed the Cripple, Penny, Snake, Nome, Flambeau, Eldorado, Bonanza and Solomon rivers to sport salmon fishing from July 16 through August 2, 1987. Issued at Nome, July 15, 1987.
16. 3-Z-17-87. Closed the Unalakleet and Shaktoolik river drainages to sport fishing for coho, sockeye, pink and chum salmon from July 22 through July 29, 1987. Issued at Nome, July 20, 1987.
17. 3-Z-19-87. Closed the Unalakleet and Shaktoolik river drainages to the sport harvest of chum, sockeye and pink salmon from July 29 through December 31, 1987. Issued at Nome, July 29, 1987.

Emergency Regulations:

In further response to unique circumstances (no Alaska Board of Fisheries action was taken in 1986 to address conservation issues in the AYK Region), a set of emergency regulations (which expired after 120 days) was adopted by the Department on February 5, 1987. Later in the year, these emergency regulations were revised and made permanent. Appendix C contains copies of the emergency regulations issued in 1987. The provisional emergency regulations consisted of the following changes to existing regulations:

Under BAG LIMITS, POSSESSION LIMITS, AND SIZE LIMITS. (5 AAC 70.020):

Overall Tanana River drainage bag and possession limits for lake trout were reduced to two and a minimum legal size limit of 18 in (46 cm) was imposed. Previous regulations through 1986 had allowed the taking of 10 lake trout with no more than two of a size greater than 20 in (51 cm) in length.

In addition to the above added sections of the regulation, sections (f) and (g) were added:

(f) In Two Bit and Monte Lakes, Tanana River drainage, there is no size limit for lake trout.

(g) In the Shaw Creek drainage, Chena River drainage, Delta Clearwater River drainage, Richardson Clearwater River drainage, and in Piledriver Slough upstream of its confluence with Moose Creek, the minimum legal size for Arctic grayling is 12 inches.

Under METHODS AND MEANS (5 AAC 70.035), sections (e), (f), (g), and (h) were added in which:

(e) In Fielding Lake, burbot may be taken by set line provided the total aggregate number of hooks does not exceed five, from October 15 through May 15;

(f) In all Tanana River drainage lakes the maximum aggregate number of hooks which may be used for burbot fishing through May 15, 1987 is five.

(g) Only unbaited artificial lures or flies may be used in the Delta Clearwater River drainage, the Richardson Clearwater River drainage, Chena River drainage upstream of the Chena River dam, Piledriver Slough upstream of its confluence with Moose Creek and the Shaw Creek drainage upstream of the Richardson Highway Bridge, and;

(h) Bait may be used only on hooks with a gap size larger than 3/4 of an inch in the Chena River drainage downstream of the Chena River Dam, in Shaw Creek downstream of the Richardson Highway Bridge, and in the Tanana River within 2 mi of the mouth of Shaw Creek.

Under WATERS CLOSED TO SPORT FISHING (5AAC 70.050), a section (f) was added:

(f) The following waters are closed to grayling fishing from April 1 to the first Saturday in June: Chena River Drainage, Delta Clearwater River Drainage Richardson Clearwater River Drainage. Shaw Creel drainage and the Tanana River within 2 mi of the mouth of Shaw Creek.

The Department declared, on July 16, that it intended to make these regulations permanent and that, it might modify or change them during the adoption process. The Department announced at that time that it would adopt additional permanent regulations dealing with sport fisheries for burbot and northern pike. The public was requested to provide input on the proposed changes. On September 24, 1987, after a series of public meetings and other public interaction, the Department submitted a revised list of Emergency Regulations to the Department of Law, intending that they become permanent regulations. Following is a list of the Emergency Regulation made permanent in 1987:

1. 5AAC 70.010 FISHING SEASONS.

(c) Pike may be taken in the waters of the Tolovana River drainage upstream of its confluence with the Tanana River only from June 1 through October 14.

2. 5AAC 70.020 BAG LIMITS, POSSESSION LIMITS, AND SIZE LIMITS. (only changes to 1986 regulations are listed here).

(b) Tanana River drainage

King salmon: 16 in or more, one fish bag limit and in possession; less than 16 in: bag and possession limit is 10 fish.

Lake trout: two fish bag limit and in possession, no size limit

Burbot in lakes: five fish bag limit and in possession

(f) In Fielding Lake and Harding Lake, the minimum legal size for lake trout is 18 in.

(g) In Fielding Lake, Harding Lake, "T" Lake and the Tangle lakes system, the bag and possession limit for burbot is two fish.

3. 5AAC 70.035 METHODS AND MEANS.

(e) Set lines may not be used to take burbot in Fielding Lake, Harding Lake, "T" Lake, and the Tangle lakes system. Burbot may be taken by set lines in all other lakes in the Tanana River drainage from October 15 through May 15. In the Tanana River drainage, the total aggregate number of hooks used on set lines, closely attended gear, and ice fishing gear, as defined in 5 AAC 75.020 and 5 AAC 75.021 may not exceed 15 or the daily bag limit for burbot in waters being fished, whichever is less.

4. 5AAC 70.050 WATERS CLOSED TO SPORT FISHING

(g) The Tangle Lakes system is closed to the taking of lake trout.

News Releases, Announcements, and Articles:

Ten news releases (also called field announcements) concerning regional sport fisheries were issued by the Department in 1987. They are listed below.

1. February 2, 1987. Fish and Game closes Minto Flats to Northern pike Fishing This news release announced that Minto Flats would be closed by emergency order to the taking of northern pike through May 31, 1987. The announcement explained that the action was taken to protect spawning northern pike.
2. February 6, 1987. Fish and Game Modifies Fishing Closures For The Glennallen and Tanana River Drainage. This announcement described changes in bag limits for lake trout and burbot in the Upper Copper/Upper Susitna rivers and Tanana River drainages, and the new limitations on set-line gear. These changes were made by Emergency Regulations. Emergency closures imposed in January were rescinded.
3. March 17, 1987. Alaska Department of Fish and Game announces sport fishery regulation meetings. This release announced public meetings at various locations throughout the interior to discuss serious conservation problems with Arctic grayling, lake trout and burbot fisheries in both Region II and III.

4. April 2, 1987. Closure of Shaw Creek Fishery. This release announced that Shaw Creek would close to all sport fishing by emergency order on April 3, 1987, due to declines in the Arctic grayling population since 1981.
5. April 14, 1987. Alaska Department of Fish and Game closes the Chena River, Delta Clearwater River, and Richardson Clearwater River to Arctic Grayling Fishing. This news release announced that the above rivers would be closed to the taking of Arctic grayling by emergency order through June 5, 1987, because of documented conservation problems.
6. April 14, 1987. Minto Flats Northern Pike Subsistence and Sport Fishery Season and Regulation Changes. This news release announced that the Board of Fisheries authorized the subsistence harvest of Minto Flats northern pike by residents of Minto Flats and Nenana. The Board also closed the winter sport fishery of northern pike in the Minto Flats from October 15 through May 31.
7. April 28, 1987. Regulations Changes For Tanana Drainage Waters. This news release provided a summary of emergency regulations that changed Arctic grayling and chinook salmon regulations in the Tanana River drainage.
8. June 8, 1987. Tangle Lakes Closed To Protect Fish. This announced the emergency order closing the Tangle lakes system to the taking of lake trout and burbot.
9. July 28, 1987. Fish and Game Closes the Salcha River To Taking of Salmon. This announced that the Salcha River was closed by emergency order to the taking of salmon. The closure was put into effect to increase chinook and chum salmon escapements.
10. August 12, 1987. Fish and Game to Reopen the Salcha River to the taking of Salmon. This release announced the emergency order reopening of the Salcha River to the taking of salmon on August 13, 1987.

Seventeen news articles concerned with AYK Region sport fisheries appeared in major Alaska newspapers or in the Alaska Fish and Game magazine in 1987. They are listed below.

1. February 5, 1987. Minto Flats area to be closed to northern pike fishing Friday. Fairbanks Daily News-Miner (FDNM) This announced that the Minto Flats would be closed to the taking of pike by emergency order from February 6 through May 31, 1987.
2. February 12, 1987. Fish and Game modifies closures. By: Christopher Batin, FDNM. This announced that the Department had issued emergency regulations that change or modify recently enacted emergency orders closing some fisheries.

3. March 27, 1987. Hearings offered on sport fish regulations. By: Christopher Batin, FDNM. This article explained the situation concerning the emergency regulations and gave the dates for the public meetings.
4. April 2, 1987. Shaw Creek fishery closed to sport fishing. By: Christopher Batin, FDNM. This article discussed the Emergency Order closure of the spring Shaw Creek Arctic grayling fishery. It also publicized a public meeting at which this and other recent closures were to be discussed on April 6.
5. April 3, 1987. Emergency rules for anglers near final draft. By: Kathi Berry, FDNM. This article informed the public that the Emergency Regulations would be published in final draft and would be available for public comment for 30 days.
6. April 17, 1987. New rules cut fishing for grayling.. By: Kathi Berry, FDNM. This article discussed reasons for the Emergency Regulations recently enacted for the Arctic grayling fishery in the Chena River.
7. April 23, 1987. Piledriver Slough will get lots of rainbow trout this summer. By: Kathi Berry, FDNM. This article described the experimental stocking of rainbow trout in Piledriver Slough due to be initiated during the summer of 1987.
8. May 9, 1987. Thousands of rainbows, newly stocked, are waiting. FDNM. This article publicized the stocking of Piledriver Slough with more than 4,200 rainbow trout during the week of May 9.
9. June 25, 1987. Piledriver Slough rainbow stocking is "marvelous concept". By: Jim Greiner, FDNM. This article discusses the stocking of Piledriver Slough with rainbow trout. Opinions of selected anglers were given and an explanation of the experimental program was presented by the author.
10. October 3, 1987. Whitefish bag limit proposed. By: Kathi Berry, FDNM. This article called attention to the fact that changes in the bag limits for whitefish are being considered by the Department because of the sharply increased harvest levels of whitefish.
11. October 20, 1987. Tolovana sportfishing for pike closed. FDNM. This article reminded the public that the Board of Fisheries adopted a regulation closing the Tolovana River drainage to the taking of northern pike from October 15 through May 31.
12. October 29, 1987. Biologists recommend reduction of whitefish take on Chatanika. By: Christopher Batin, FDNM. This article discussed the various conservation problems with the whitefish harvest levels in the Chatanika River. As a result of those concerns, the Department proposed a daily bag limit of 15 whitefish.

13. March-April, 1987. Pleasure with pike. By: Richard D. Peckham. Alaska Fish and Game Magazine. Volume 19, No. 2. Interior Alaska northern pike fishing is discussed, with tips and where to go, and how to fish for this species. Two photos are included.
14. March-April, 1987. Grayling fishing in the Tanana River drainage. By: Rolland A. Holmes. Alaska Fish and Game Magazine. Volume 19, No. 2. The more popular Arctic grayling fishing waters are mentioned in this article on grayling fishing, feeding behavior and habits.
15. March-April, 1987. Fishing Interior Alaska's stocked lakes. By: Michael Doxey. Alaska Fish and Game Magazine. Volume 19, No. 2. The article discusses summer and winter fishing techniques for stocked lakes, particularly Little Donna and Quartz lakes. Two photos are included.
16. March-April, 1987. Sheefish fishing in Alaska. By: Kenneth T. Alt. Alaska Fish and Game Magazine. Volume 19, No. 2. Where and how to fish for sheefish in the AYK Region is discussed. One photo is included.
17. March-April, 1987. Summer burbot. By: Alan H. Townsend. Alaska Fish and Game Magazine. Volume 19, No. 2. Techniques, where and how to fish, and preparation of the catch are discussed.

Preseason and Postseason Regulatory Activities

Regulatory changes normally begin with the development of staff and public proposals for Board of Fisheries consideration. Board of Fisheries actions on proposals result in regulatory changes. The Alaska Board of Fisheries meets annually to consider new finfish regulation changes. Proposals from each area of the state are considered on a rotating basis whereby AYK Region finfish proposals are taken up in alternate years.

Advisory Committees:

Public input concerning regulation changes is provided by several means, including direct testimony to the Board of Fisheries and by participation in local fish and game advisory committees. Local advisory committees have been established in many rural areas of the state to assist the Boards of Fish and Game in assessing fisheries issues and proposed regulation changes in the areas that will be affected. Most active committees meet at least once a year, usually in the fall prior to the Board of Fisheries meeting. Advisory meetings are important in allowing direct public interaction with Department staff who are expected to attend, answer questions, and provide clarification concerning proposed regulatory changes.

Active advisory committees in the AYK Region during 1987 totalled 27. Advisory committees included the following: Central Bering Sea, Lower Kuskokwim, Central Kuskokwim, Lower Yukon, Western Arctic, Eastern Arctic,

Norton Sound, Southern Norton Sound, Kotzebue, Northern Seward Peninsula, Upper Kobuk, Lower Kobuk, Noatak/Kivalina, McGrath, Tok Cutoff/Nabesna Road, Clear/Healy, Delta, Denali, Upper Tanana/Fortymile, Yukon Flats, Fairbanks, Tanana, Ruby, Middle Yukon, Koyukuk, Grayling/Anvik/Shageluk/Holy Cross, and Eagle.

Several of the committees did not meet to discuss fisheries issues in 1987. Sport Fisheries Division staff participated in meetings of the Fairbanks, Delta, Tok, Clear/Healy, Paxson, Tanana, Middle Yukon and Norton Sound committees in 1987. Sport Fisheries issues in Kotzebue, and in the lower Yukon and Kuskokwim River areas were handled by Division of Commercial Fisheries staff attending those respective meetings.

Alaska Board of Fisheries:

The Board of Fisheries met in early December 1987 to consider commercial, sport, subsistence, and personal use finfish proposals from the AYK Region. A total of 47 sport fish related proposals from Region III were submitted by the public and Department staff. The following is a summary of proposals submitted for Board of Fisheries consideration during 1987. The proposal numbers listed are those assigned in the 1987 Board of Fisheries proposal book. A designation following each proposal number identifies whether the proposal originated with Department staff or a member of the public.

Proposal Number

263. Staff. Lower the bag and possession limits from five to three chinook salmon of which only two fish may exceed 28 in (71 cm) in length, for the AYK Area exclusive of the Tanana River drainage, Seward Peninsula, Unalakleet River drainage and the Kuskokwim River drainage. Proposal adopted.
264. Staff. Reduce the bag and possession limit for the Kuskokwim River drainage chinook salmon from five to one. Proposal adopted.
265. Staff. Reduce the bag and possession limit from five to one chinook salmon in the Unalakleet River drainage and in Seward Peninsula waters. Proposal adopted.
266. Staff. Close the Upper Salcha River to the taking of salmon upstream of a marker placed approximately 2.5 mi (4 km) above the Salcha River bridge. Proposal adopted.
267. Staff. Reduce the bag and possession limits for salmon species other than chinook salmon from 10 to five in all waters tributary to Kuskokwim Bay. Proposal adopted.

268. Staff. Reduce non-chinook salmon bag and possession limits in the Nome and Snake rivers from 15 to 10 only three of which may be chum or coho salmon. Proposal adopted but amended as written above⁴.
269. Staff. Establish a possession limit of 10 sheefish in the AYK Area exclusive of the Tanana River drainage and the Kobuk River drainage upstream of the mouth of the Mauneluk River. Proposal adopted.
270. Staff. Lower the bag and possession limit for sheefish to two in the Kobuk River drainage upstream of the mouth of the Mauneluk River. Proposal adopted.
271. Public. Close the Paw River to sport fishing for sheefish above the Mauneluk River. No action taken.
272. Staff. Delete the Trans-Alaska pipeline corridor special regulation relative to sheefish and open the corridor to the taking of sheefish. Proposal adopted.
273. Public. Close the Dall River to sport fishing. Proposal adopted in the following amended form: Establish a bag and possession limit of five northern pike of which only one can exceed 30 in (76 cm) in the following area: Yukon River and its tributaries from the mouth of the Tanana upstream to and including the Hodzana River.
274. Public. Close sport fishing on the Kanektok River from Kagatti Lake to the village corporation lower boundary. Proposal rejected.
275. Public. Prohibit the use of jet inboard/outboard lower units by sport fishermen on the Kanektok River. Proposal rejected.
276. Public. Prohibit sport fishing for salmon 24 hours before, during, and six hours after a commercial fishing period in the Kanektok River. Proposal rejected.
277. Public. Prohibit sport fishing on the Goodnews and the Kanektok rivers or close the rivers to sport fishing while commercial fishing is closed. Proposal adopted in the following amended form: No person may sport fish from a stream or river bank within 300 ft (91 m) of a legally operating subsistence gill net on the Kanektok or Goodnews rivers downstream from the Togiak National Wildlife Refuge wilderness boundary.
278. Public. Require anglers to retain all fish caught in the Goodnews and Kanektok rivers as part of that persons bag limit. Proposal rejected.
279. Public. Prohibit catch and release on the Goodnews and Kanektok rivers. Proposal rejected.

⁴ Proposal as adopted limited the restriction to only the Nome and Snake Rivers, but was printed in the Alaska Administrative Code and the Sport Fish regulations booklet to include all of the Seward Peninsula from Cape Darby to Cape Prince of Wales.

280. Staff. Establish a bag and possession limit for Tanana River drainage waters of 15 whitefish. Proposal adopted.
281. Staff. Establish a bag and possession limit of 15 burbot for the AYK Area waters exclusive of the Tanana River drainage. Proposal adopted.
282. Staff. Delete the use of spears by persons completely submerged as a method of harvesting burbot. Proposal combined with No. 283, 285, 288, and 302 and adopted as follows: Sucker and burbot may be taken by spear or bow and arrow from January 1 through December 31. Northern pike and whitefish (excluding sheefish) may be taken by spear or bow and arrow from September 1 through April 30, and may be speared by persons completely submerged from January 1 through December 31.
283. Staff. Allow the use of spears by persons completely submerged as a method of harvesting suckers in the AYK Area. Proposal combined with No. 285, 288, and 302 and adopted as under No. 282.
284. Staff. Establish a bag and possession limit for Tanana River drainage rivers and streams of 15 burbot. Proposal adopted.
285. Staff. Eliminate the use of spears as a means to harvest burbot in all lakes in the Tanana River drainage. Proposal combined with No. 283, 288, and 302 and adopted as under No. 282.
286. Staff. Establish a bag and possession limit of 10 fish per day for northern pike in the AYK Area exclusive of the Tanana River drainage. Proposal adopted.
287. Staff. Reduce the bag and possession limit for northern pike in the Tanana River drainage from 10 to five fish, of which only one can exceed 30 in (76 cm).
288. Staff. Specify April 30 as the closing date for northern pike spear fishing season in the Tanana River drainage. Proposal combined with No. 283, 285, and 302 and adopted as under No. 282.
289. Staff. Reduce the bag and possession limit for lake trout from 10 to four, with no size limit, in the AYK Area exclusive of the Tanana River drainage. Proposal adopted.
290. Staff. Delete the special regulations under "Waters closed to Sport Fishing" section relative to Tangle Lake system lake trout and provide a basis for the Board to select a less restrictive management plan for Tangle Lake system lake trout fisheries after full public review. Proposal amended and adopted as follows: In the Tangle Lake system, the bag and possession limit is one lake trout, the minimum legal size is 18 in.

291. Staff. Eliminate the special area between Cantwell and Paxson where the Denali Highway acts as a division line for sport fish regulations. Proposal adopted.
292. Staff. Establish a bag and possession limit of 10 grayling in the AYK Area exclusive of the Tanana River drainage, Unalakleet River drainage, and Seward Peninsula waters, and to delete the present size restriction. Proposal adopted.
293. Staff. Reduce the bag and possession limit for grayling in Seward Peninsula waters and in the Unalakleet River drainage to five fish, of which only one can be 15 in (38 cm) or more. Proposal amended and adopted as follows: Reduce the bag and possession limit for grayling in the Unalakleet River drainage and all waters draining into the Bering Sea from Cape Darby to Cape Prince of Wales on the Seward Peninsula to five fish of which only one can be 15 in. or more.
294. Staff. Delete special regulations under "Waters Closed to Sport Fishing" section relative to springtime closure of grayling fishing in five areas of the Tanana River drainage and instead apply "catch and release" regulations to these five waters plus two additional waters (Salcha River and Mineral Lake Outlet) in the Tanana River drainage. Proposal adopted.
295. Staff. Add the Salcha River and its tributaries and Mineral Lake outlet to the series of Tanana River drainage waters for which only unbaited, artificial lures or flies may be used. Proposal adopted.
296. Staff. Add Salcha River and Mineral Lake outlet to the waters for which the minimum 12 in (30 cm) limit for harvest of grayling applies. Proposal adopted.
297. Staff. Establish catch and release regulations in a section of the upper Chena River. Proposal amended and adopted as follows: In the following location in the Chena River from the first Saturday in June until March 31, grayling may not be possessed or retained. All grayling must be released immediately from the confluence of the south fork (river mile 77) to the first bridge (river mile 88).
298. Staff. Decrease the bag and possession limit of rainbow trout in Tanana River drainage rivers, streams and sloughs from 12 rainbow trout to five rainbow trout. Proposal adopted.
299. Public. Reduce the rainbow trout bag limit in Sansing Lake from 10 fish to three fish. Proposal adopted.
300. Staff. Remove the size limit for rainbow trout in Tanana River drainage lakes. No action taken on proposal.
301. Public. Increase the bag limit of grayling in the Nenana River drainage to 10 per day and 20 in possession. Proposal rejected.

302. Public. Allow the taking of suckers with bow and arrow from June 1 through August 31, in the Tanana River drainage. Proposal combined with No. 283, 285, and 288 and adopted as under No. 282.
303. Staff. Delete the combination bag and possession limits for salmon, char, lake trout and grayling for Beaufort Sea drainages. Proposal adopted.
304. Staff. Exempt temporary ice fishing shelters from Department registration requirement. Proposal adopted.
305. Public. Allow possession of live blackfish without a permit from October 15 to February 28 in the Yukon River drainage between Kaltag and Ruby. No action taken.
408. Staff. Establish a separate bag and possession limit of 10 Dolly Varden/Arctic char in the AYK Area. Proposal adopted.
409. Staff. Establish a bag and possession limit of 10 Dolly Varden/Arctic char in the Wulik, Kivalina and Noatak river drainages, of which no more than two may be over 20 in (51 cm) in length. Proposal adopted.
410. Staff. Establish a management plan for the recreational chinook salmon fishery in the Tanana River drainage and define guideline harvest ranges for that recreational fishery. Proposal amended and adopted as follows: When the annual chinook salmon guideline sport harvest of from 300 to 700 fish in the Salcha River has been attained, ADFG will close the recreational fishery.

Development of AYK Sport Fishing Regulations:

As described in preceding sections, many regulatory changes were put into effect in 1987, some by emergency order and others by temporary and permanent emergency regulations. Published regulations for 1987 are reproduced as Appendix B which also includes unpublished changes enacted by emergency regulation that went into effect in 1987. In 1987, sweeping revisions to existing sport fishing regulations for AYK Region fisheries were initiated.

AYK SPORT FISHERIES ENHANCEMENT

AYK Region Lake Stocking Program

Selected lakes and ponds of the Tanana River Valley are stocked on a continuing basis with rainbow trout, coho salmon, Arctic grayling, chinook salmon, sheefish and Arctic char. Resulting fisheries comprise an important component of the total area harvest, and supported over one-third of the recreational angling effort in the Tanana River drainage during 1987 (Doxey 1988). By providing stocked fish in the Tanana River valley, the ADFG hopes to reduce fishing pressure on heavily utilized native stocks and to provide better year round fishing opportunities.

Lake stocking in the Tanana River valley occurs in an approximate 130,000 km² area, in which most stocking takes place near communities and along the road system, but also in a number of remote locations accessible only by off-road vehicle (ORV), dog team, or airplane. About half of the yearly sport effort on stocked lakes takes place during the winter on larger accessible lakes.

ADFG stocking in the Interior began in the mid-1950's when barren lakes along the road system were stocked with rainbow trout or salmon. Between 1968 and the early 1980's, 15 of the 50 regularly stocked lakes (including Birch and Quartz lakes) were chemically treated to accelerate growth rates of stocked fish and to increase returns of target fish to the creel (Doxey 1987a).

Throughout the 1970's, hatchery ability to provide stocked fingerlings steadily increased as fisheries enhancement received growing emphasis. Native Alaska rainbow trout brood stocks were developed when the importation of eggs from outside the state was discontinued in the late 1970's. As suitable brood stocks were developed and new hatcheries were put into production, numbers of available stocked fish increased so that by 1985, average annual harvest and effort levels for stocked waters had risen by more than 40% and 20%, respectively (Doxey 1987a).

The growth and success of the regional stocking program has been largely due to the development of, and production from, Alaska state hatcheries, particularly the Clear Hatchery, located about 145 km south of Fairbanks at the Clear Air Force Station (Figure 8). Hatchery production began in 1977, with an initial mission to experimentally incubate, rear and release chum salmon to determine whether large scale enhancement of salmon would be feasible under conditions found in the Interior. In the mid-1980's, production of sport fish species took precedence over anadromous salmonids, and a large proportion of the Clear Hatchery output consisted of fingerling and subcatchable rainbow trout, coho salmon, and Arctic grayling. The facility presently has a capacity of about 9.0 million eggs.

Success of the stocking program is evaluated annually. The level of evaluation varies according to the size and accessibility of the stocked water body and the importance and intensity of the sport fishery. Minimal evaluations address the question of whether the stocked fish survived and are providing sport fishing. More comprehensive evaluations provide limnological data, growth rate data, and fishery statistics such as CPUE, population estimates, comparison of performance between species, and other parameters.

1987 Stocking Results

Approximately 3.3 million fish of six species were stocked in area lakes and streams in 1987, of which 1,876,000 were rainbow trout. By comparison, 1.45 million fish were stocked in the area in 1986, of which 700,000 were rainbow trout.

Most of the stocked rainbow trout in 1987 were fingerling (from 0.5 to 2.0 g) and subcatchable (approximately 25 g) sized fish reared at Clear Hatchery, but about 38,000 were of catchable size (from 100-155 g) reared at the Fort Richardson Hatchery in Anchorage (Table 11). All of the rainbow trout were of

Table 11. Number and size of rainbow trout stocked in AYK waters in 1987.

Receiving Water	Number Stocked	Size (g)
Backdown Lake	500	2.0
Bathing Beauty Pond	500	2.0
Birch Lake	34,039	28.1
Bluff Cabin Lake	10,000	2.0
Bullwinkle Lake	800	2.0
Chena Lake	25,406	109.0-154.0
Chet lake	1,000	2.0
Craig Lake	4,000	2.0
Doc Lake	1,500	2.0
Donna Lake	11,600	2.0
Dune Lake	10,000	2.0
Forrest Lake	7,000	2.0
Geskamina Lake	10,000	2.0
Ghost Lake	1,000	2.0
Grayling Lake	500	2.0
Harding Lake	582,021	2.0
Harding Lake	544,200	0.15
Jan Lake	8,800	2.0
Johnson Road Pit # 1	500	2.0
Ken's Pond	600	2.0
Koole Lake	30,000	2.0
Les's Lake	750	2.0
Lisa Lake	10,000	2.0
Little Harding Lake	1,000	2.0
Little Donna Lake	9,400	2.0
Lost Lake	1,000	2.0
Manchu Lake	10,000	2.0
Mark Lake	4,000	2.0
Monte Lake	20,000	2.0
Nickle Lake	1,000	2.0
No Mercy Lake	1,500	2.0
North Twin Lake	4,000	2.0
Piledriver Slough	12,500	109.0-154.0
Piledriver Slough	12,500	26.0
Pileddiver Slough	35,000	2.0

-continued-

Table 11. (page 2 of 2)

Receiving Water	Number Stocked	Size (g)
Quartz Lake	407,917	2.0
Quartz Lake	10,000	28.1
Rainbow Lake	25,000	2.0
Rockhound Lake	1,500	2.0
Roy's Lake	10,000	2.0
Sansing Lake	450	2.0
Sansing Lake	170	24.9
South Johnson Lake	1,400	2.0
South Twin Lake	4,000	2.0
Spencer Lake	5,000	2.0
Thirty one mile Pit, Richardson Hwy.	500	2.0
45.5 Mi. Chena Hot Springs Road Pit	1,000	2.0
Weasel Lake	2,000	2.0
Total	1,875,553	

the Swanson River (Kenai Peninsula) strain. Rainbow trout were stocked into Piledriver Slough for the first time in 1987, with the release of 12,500 catchable size (100-155 g), 12,500 subcatchable (26.0 g) size and 35,000 fingerlings (2.0 g) size fish.

Approximately 834,000 fingerling-and fry-size (< 0.5 g) Arctic grayling were stocked in area lakes, ponds, pits, and streams in 1987, all of Moose Lake (Susitna River drainage) brood stock (Table 12). These fish were incubated and reared at the Clear Hatchery.

Sheefish have been experimentally stocked in Tanana Area lakes and ponds for several years to determine whether such an enhancement effort would be feasible for this species. About 248,000 sheefish were stocked in 1987 (Table 13) in four separate locations. The majority (247,000) were planted in Harding Lake as 4.0 g fingerling, and 35 large (2,400 g) sheefish were also released in this lake. A total of 1,000 sheefish of fingerling size (11.0 g) were released in three gravel pits in the area.

About 13,000, 4.0 g fingerling age 0 Arctic char from Amiloyak Lake (Headwaters of Chandler River) were planted in Trap Lake in the Kantishna River drainage in 1986, the first Arctic char stocking in Alaska (Table 13). Age 1 char were captured in test nets in 1987, indicating that stocked char had survived overwinter. A total of 4,153 Aleknagik (Bristol Bay) Arctic char were stocked in six lakes along the Coal Mine Road near Delta Junction in June, 1987.

Chinook salmon fingerlings (38,000 at 10 g) were stocked in 1987 in lakes of the Tanana Area (Table 13). The fry (Crooked Creek, Kenai Peninsula stock) were reared in the Elmendorf Hatchery and subsequently released in the Interior.

A total of 322,000 coho salmon was stocked in Tanana Area lakes and ponds in 1987 (Table 14). Stocked coho salmon were of fry (2.0 g) or fingerling (5.0 g) size. All released coho salmon were of Wood Creek (Nenana River) stock, and all were reared at the Clear Hatchery.

An additional enhancement activity in 1987 was a lake trout egg-take at Paxson Lake.

Anadromous Fish Releases by State Hatcheries

In addition to anadromous species stocked in landlocked lakes in the Tanana drainage, the Clear Hatchery stocked salmonids into waters of the Tanana River with the intent of enhancing anadromous returns. A total of 108,511 chinook salmon of Clear Creek (Nenana River system) stock were released into Wood Creek in May, 1987. Released salmon were from the 1986 brood year; length ranged from 86 to 92 mm, and weight ranged from 8.0 to 9.7 g. A total of 242,291 coho salmon of Wood Creek stock were released into Wood Creek in 1987. Released coho salmon ranged in length from 56 to 81 mm and in weight from about 2.0 to 5.0 g.

Table 12. Number and size of Arctic grayling stocked in AYK waters in 1987.

Receiving Water	Number Stocked	Size(g)
Bathing Beauty Pond	1,000	4.00
Bolio Lake	20,000	0.02
Delta Clearwater River	5,000	4.00
Delta Clearwater River	5,000	8.00
Delta Unnamed (Luke Lake)	500	4.00
Dune Lake	5,000	4.00
Engineer Hill Lake	25,000	0.02
Goodpaster River	7,989	8.00
Grayling Lake	1,000	4.00
Harding Lake	640,000	0.02
Johnson Road #1	1,000	4.00
Johnson Road #2	10,000	0.02
Left O.P. Pond	16,088	0.02
Sansing Lake	969	100.00
Sansing Lake	50	265.00
Sheefish Lake	10,000	0.02
Walden Pond	15,000	0.02
West Pond	25,000	0.02
Steese Hwy Pits:		
Mi. 29.5	1,000	4.00
" 30.6	1,000	4.00
" 31.6	400	4.00
" 33.0	10,000	0.02
" 33.5	10,000	0.02
" 34.6	8,000	0.02
" 35.8	1,000	4.00
" 36.6	1,000	4.00
Chena Hot Springs Rd Pits:		
Mi. 32.9	1,000	4.00
" 42.8	1,000	4.00
" 45.5	10,000	0.02
" 47.9	800	4.00
Total:	833,796	

Table 13. Number and size of Arctic char, chinook salmon, and sheefish stocked in AYK waters in 1987.

Receiving water	Number Stocked	Size (g)
<u>Arctic char</u>		
Brodie Lake	1,000	4.3
Rangeview Lake	900	4.3
Dick's Pond	1,000	4.3
Ken's Pond	153	4.3
Backdown Lake	600	4.3
Last Lake	500	4.3
Char subtotal	4,153	
<u>Chinook salmon</u>		
Bolio Lake	21,718	10.0
Donnelly Lake	6,000	10.0
Little Harding Lake	10,000	10.0
Chinook subtotal	37,718	
<u>Sheefish</u>		
Harding Lake	246,839	4.0
Harding Lake	35	2,400.0
Silver Fox Pit	400	11.0
Weigh Station Pond #1	200	11.0
Weigh Station Pond #2	400	11.0
Sheefish subtotal	247,874	

Table 14. Number and size of coho salmon stocked in AYK waters in 1987.

Receiving water	Number Stocked	Size (g)
28 Mile Richardson Hwy Pit	500	5.0
31 Mile Richardson Hwy Pit	500	5.0
Birch Lake	40,000	5.0
Chena Lake	30,000	5.0
Dune Lake	20,000	2.0
Eight Mile Lake	15,000	5.0
Geskakmina Lake	20,000	2.0
Hangar Pit	2,600	5.0
Johnson Road Pit # 1	500	5.0
Long Pond	700	5.0
Lost Lake	10,000	5.0
Manchu Lake	5,000	5.0
Moose Lake	8,000	5.0
Quartz Lake	85,000	2.0
Quartz Lake	83,500	5.0
Round Pond	400	5.0
Sansing Lake	200	5.0
Total	321,900	

The other state hatchery in the AYK Region was initiated in 1980 near Kotzebue at Sikusiliuq Creek, approximately 50 km upstream from the mouth of the Noatak River (Figure 14). The initial purpose of the facility was to examine the feasibility of large-scale chum salmon enhancement in a far northern environment. Hatchery expansion starting in 1987 is intended to bring the facility into a larger scale production mode than in prior years of feasibility testing. Enhanced hatchery returns are intended to benefit the salmon gill net fishery which operates near Kotzebue in marine waters. The scale of salmon releases has been small, less than two million chum salmon fry. Returns from prior year releases have been identified both in the commercial fishery and at the hatchery. Releases of chum salmon fry in the lower Noatak River in 1987 totalled 1,440,000 fish at an average size of approximately 0.5 g. Returns of about 8,800 adult chum salmon in 1987 were identified from hatchery releases in 1982-1984. Expanded hatchery capability was initiated in 1987 with the installation of new egg and fry incubators in order to increase capacity to 10 million eggs. In addition, new raceways were installed to allow short term fry rearing.

LAND USE, HABITAT AND WATER QUALITY

Habitat-Related Fisheries Issues

Commercial development of minerals and timber and construction of highways can have significant impacts on watersheds and fishery resources. A brief description of the types of these commercial developments in the Tanana and AYK areas and known impacts to fisheries follows.

Placer Mining:

The majority of Alaska's placer mining takes place in the AYK region. Placer mining effluents, if not controlled, have the potential to significantly alter stream habitats and to impact fish populations. Elevated stream turbidity and sediment loads may reduce oxygen exchange rates through abrasion of gill tissues, prevent foraging by sight feeding fishes, limit aquatic plant growth by displacement or smothering, and generally reduce abundance and or diversity of aquatic macroinvertebrates important for fish production (Weber 1986). Placer mining activities may also increase the toxic metal content (arsenic, mercury) of stream water (ADEC 1986). In addition to changes in water quality, placer mining can affect the physical characteristics of the stream bed by altering channel flow and modifying riparian habitat. Tailing deposits can inhibit fish passage and decrease overwintering habitat.

In Alaska in 1987, 8,276 new mining claims (on state, private and federal lands) were recorded by the Alaska Department of Natural Resources (ADNR), a receiving agency for state and federal mining permits (Bundtzen et. al. 1988). The ADFG issues permits for mining in streams supporting anadromous and resident fish per its Alaska State Statutes Title 16 authority. In some cases, where the development is within a resident fish stream and will not

block fish passage, or where fish are not present, permits may not be required⁵.

Although reported gold production decreased in 1986 from previous years, reported production in 1987 increased dramatically, from 4,540 kg in 1986 to more than 6,500 kg for the entire state. The majority of the gold was produced from 202 placer mines, with the remainder coming from three small lode operations (Bundtzen et al. 1988). Expanded operations at several large projects is considered responsible for increased production. The number of mechanized placer mines, which are the main producers of gold bullion, increased only marginally from 1986.

A 1987 lawsuit by the Sierra Club against Bureau of Land Management (BLM) could greatly impact small mining operations for many years. A federal injunction resulting from the suit will halt mining on claims that disturb more than five acres of land in the Birch Creek, Fortymile River, Beaver Creek, and Minto Flats drainages until BLM completes cumulative environmental impact assessments for those lands (Bundtzen et al. 1988). The U.S. Army Corps of Engineers, beginning in 1988 will require much more detailed information in permit applications from Alaska mine operators than has previously been required.

The State of Alaska has had turbidity standards for mine water discharge since the early 1970's and since 1986, settling ponds have been required to reduce turbidity in receiving waters. Bundtzen et al. (1987) reported that in 1986 most miners were not in compliance with state law, but improvements were noted in 1987 (Bundtzen et al. 1988). A listing of streams impacted by placer mining has been compiled by ADEC (1986). Bundtzen et al. (1988) contains a summary of 1987 mining activities.

Gravel Mining:

There are few documented instances where gravel mining in the AYK Region has affected fish populations. Gravel mining of a streambed has the potential to cause instream fanning, erosion, and deterioration of water quality and fish habitat (ADEC 1986). A complete listing of gravel mining sites and impacted streams is available in ADEC (1986) and Bundtzen et al. (1988) contains a listing of gravel mine operations in 1987. Reclamation of 19 gravel mine pits in the Prudhoe Bay area of the North Slope has increased overwintering habitat for fish inhabiting connecting streams and has increased fish production (Hemming 1988).

Industrial Metals Development:

Large-scale industrial metals operations did not significantly impact sport fishery resources in the AYK Region in 1987. Offshore dredging for gold in Norton Sound by the 'Bima' (world's largest bucketline dredge owned by Western Gold Exploration and Mining Co.) was conducted from June 16 through November 23 and recovered 1,022 kg of refined gold (Bundtzen et al. 1988).

⁵ Alan Townsend. 1988. Personal Communication. ADFG, Division of Habitat, 1300 College Rd., Fairbanks, AK 99701.

Environmental effects of this operation on nearshore habitats and fisheries in the Nome area have been monitored by industry consultants, and the results of monitoring efforts are reviewed by agencies at regular intervals.

Work was initiated for the construction of the Red Dog Mine in the headwaters of the Wulik River north of Kotzebue. In October 1986 the COMINCO Board approved development of the zinc-lead-silver deposit, with production scheduled for 1991 following road and port development. During the construction phase, workers are prohibited by contract with NANA Corp. from participating in sport or subsistence fishing and hunting. Thus, an influx of workers did not impact the harvest of fish near the construction area. Road and culvert construction was closely monitored by ADFG Habitat Division personnel, and no lasting impacts to fish are believed to have occurred⁶. During 1987, the 80 km long road from the port site to the mine site was completed. Impacts to Dolly Varden populations in the area would occur if containment of the mine tailings pond failed and heavy metals washed into the Wulik River drainage.

Oil and Gas Development:

Oil and gas development in the AYK Region is presently restricted to the North Slope. North Slope development has affected fish habitat on and near transportation corridors (such as the Dalton Highway and the Alyeska Pipeline) and by the extraction of gravel for road and building construction and maintenance. Investigation of impacts from a waterflood seawater treatment plant on the Kuparuk River by Dames and Moore (1987) in 1986 did not reveal significant impacts on fish populations. There is evidence that construction of Prudhoe Bay's West Dock Causeway has disrupted east and west migratory movements as well as recruitment of Arctic cisco in the Colville and Sagavanirkok rivers (Gallaway et al. 1987; Moulton et al. 1986). Documentation of oil spills and resulting adverse impacts on fish populations from contamination is lacking in the AYK Area. A number of studies throughout the 1980's have tried to determine or predict impacts from offshore gravel causeways, such as the Endicott Causeway, in the Beaufort Sea to fish, fisheries, and fisheries habitat.

Timberland Development:

Logging had no significant impact to fisheries resources in the AYK Region in 1987. Little commercial logging presently occurs in AYK. In Galena a limited commercial harvest of spruce for domestic markets takes place (USFWS 1987b). The largest commercial timber harvests in the Kuskokwim Basin occur from McGrath to Stony River (ADNR 1988). Some commercial logging of spruce currently occurs in the Tanana River basin, primarily on state owned land along the Tanana River.

Road construction associated with logging could impact fish populations by accelerating the rate of soil erosion and sedimentation in streams, however,

⁶ Matt Robus. 1988. Personal Communication. ADFG, Division of Habitat, 1300 College Rd., Fairbanks, AK 99701.

because of the minimal level of industry development at the present time, no such problems have been identified in the region.

Highway Development:

Roads allow increased access to streams and lakes, thereby increasing the utilization of sport fishery resources. Improperly designed or constructed road culverts can create partial or complete barriers to fish migration. Major highways in the AYK region include the Steese Highway which accesses the Yukon River and Birch Creek; the Taylor Highway leading to the Forty-Mile and Yukon rivers; the Parks and Richardson Highways which provide access to the Tanana River and many of its tributaries and lakes; the Dalton Highway to the North Slope which crosses the Yukon River, upper tributaries to the Koyukuk River and the Sagavanirktok and Kuparak rivers on the North Slope. A newly-constructed road north of Kotzebue near the Wulik River leads to the Red Dog Mine. The Seward Peninsula has three major roads which cross more than a dozen significant rivers for sport fishing.

Culvert construction is frequently reviewed by ADFG's Habitat Division for effects on migrating fish. Of the road systems in the AYK Region, culvert crossings on the Dalton, Red Dog Mine and Seward Peninsula Highways have been of most concern to the Department. There are 40 - 50 culverts on the Seward Peninsula built in the 1950's of which many constitute partial barriers for fish. Habitat Division personnel are working with the Alaska Department of Transportation to improve stream habitat, for example, by removing gravel berms in the Nome and Pilgrim rivers which will provide more rearing habitat for young Arctic grayling.

Commercial Utilization of Fisheries Resources

Commercial sport fishing activities, through establishment of lodges and guiding services, offers a source of revenue to residents in the Tanana and AYK areas. A brief description of known commercial uses of sport fish species follows.

Wilderness Lodges and Guiding:

Lodges and sport fish guiding operations (including outfitters) are significant factors in the utilization of sport fishery resources in AYK, although the extent of this influence has yet to be fully determined. More information regarding the location and operation of lodges and guiding and outfitting operations is needed. A partial list of the type of operation at various locations can be found in Appendix D. The number of resident or nonresident clients served, species targeted, or types of fishing experiences offered at these locations is presently not well documented.

Commercial Fisheries:

Commercial fisheries in the AYK Region annually harvest salmon, herring, and a small amount of shellfish. These fisheries are managed by ADFG, Commercial Fisheries Division personnel stationed in Bethel for the Kuskokwim River and Kuskokwim Bay fisheries, Emmonak for the lower Yukon River and Yukon River

Delta, Fairbanks for the upper Yukon and Tanana rivers, and Nome for fisheries in Kotzebue and Norton Sound. Harvests and effort for these fisheries are reported in Whitmore et al. 1988, Francisco et al. 1988, and Merkouris and Lean 1988.

Commercial fisheries for finfish species other than salmon, or herring, are sometimes allowed under authority of a permit issued by the Commissioner of the ADFG or his designee, usually an area manager of the Division of Commercial Fisheries. Permits to commercially harvest whitefish, sheefish, northern pike, blackfish *Dallia pectoralis*, lamprey *Lampetra japonica*, Dolly Varden and burbot are issued occasionally for limited (usually local) commercial markets. In many cases, permits are issued by ADFG, but harvests are either not made or are not reported. Few instances of the commercial harvest of non-anadromous species were reported for the AYK Region in 1987 and the Division of Commercial Fisheries maintains records of such harvests.

Reported commercial harvests of freshwater species in the Norton Sound and Kotzebue Area in 1987 (Merkouris and Lean 1988) include a minimum⁷ of 997 sheefish from Hotham Inlet near Kotzebue. Adult Dolly Varden taken incidentally in the Kotzebue commercial chum salmon fishery are sometimes sold to commercial fish processors. A total of 1,261 of these fish were harvested and sold in 1987. The mean weight of the commercially sold char was 3.14 kg. No permits were issued in either the Norton Sound or Kotzebue commercial fishery areas in 1987 for the harvest of whitefish or other freshwater species such as burbot or northern pike, and no sales of those species is recorded. A local marketing cooperative, known as the Selawik Fish Project, was initiated in 1985 for the purpose of developing markets for locally available fisheries products. The cooperative became inactive in 1987. Freshwater fishery permits were applied for and approved for this enterprise in 1986, but no applications was made for the 1987 calendar year.

A fishery has taken place on the Colville River since 1964 for broad whitefish, humpback whitefish, Arctic cisco and least cisco. Reported harvests for this fishery in 1987 include: 5 broad whitefish; 1,989 humpback whitefish, 24,769 Arctic cisco, and 10,922 least cisco (Whitmore et al. 1988). Freshwater fishery permits have been issued in various years for whitefish at Healy Lake, whitefish in Lake Minchumina, and burbot in the Tanana River. No harvests were reported in 1987. Reported sales of freshwater species in the lower Yukon River in 1987 include 2,144 whitefish (3,431 kg) (Whitmore et al. 1988).

Land Withdrawals, Status, and Planning

Land use designations by private owners, state, or federal agencies may affect fisheries management considerations within given land parcels. A brief description of various land designations in the Tanana and AYK areas and known influences on the use of sport fish within land units follows.

⁷ Fall 1987 fishery was not completed at the time of data report (Merkouris and Lean 1988)

ANILCA:

The Alaska National Interest Lands Conservation Act (ANILCA), enacted into law in 1980, completed the implementation of the Alaska Native Claims Settlement Act (ANCSA) and addressed outstanding issues such as subsistence opportunity, energy development, economic growth and transportation planning. Legislative solutions to these issues included the creation or expansion of five national conservation systems in Alaska: national parks, wildlife refuges, wild and scenic rivers, wilderness preservation lands and national forests.

The purpose of ANILCA is to preserve for future generations certain lands and waters in Alaska, protect resources related to subsistence needs and the subsistence lifestyle for rural residents, and to protect those resources related to recreational opportunities, such as sport fishing and hunting (ANILCA 1980). The Act directs specific management guidelines for conservation system units within Alaska. To maintain state responsibility for fish and game management on newly designated conservation system units, the ANILCA required the state to distinguish between user groups and assign priority opportunities for subsistence uses of fish and game resources.

National Parks, Monuments and Preserves:

A memorandum of understanding exists between the State of Alaska and the National Park Service (NPS) which allows state fish and game regulations to apply on park lands except when a more restrictive harvest approach is desired by NPS. NPS may promulgate regulations concerning consumptive uses of resources which are more restrictive than state laws. The ANILCA directs the NPS to provide opportunities for continued subsistence and traditional activities.

Park land designation has some influence on utilization of the sport fish resource by restricting types of development within the parks. Large scale commercial development (ie. fishing lodges) is not allowed, but small lodge facilities for a few guests have been allowed in Kobuk National Park. Construction of temporary facilities (such as fish camps or tents) on park lands in Alaska was granted under ANILCA, however the National Park Service attempted to prohibit these facilities. The state entered in a lawsuit in 1986 (unresolved in 1987) regarding cabins on park lands, to preserve temporary facility privileges. NPS goals include minimizing the sport fish take by encouraging release of captured fish or the taking of only small individuals of the more abundant species (NPS 1985a, 1986a). Motorized boat, snow machine, and airplane access is allowed for sport fishing on park lands in Alaska. Fish stocking or enhancement activities can be allowed if the purpose is to restore fish populations to "natural or healthy" levels.

Conservation system units within AYK (Figure 16) are as follows:

1. Kobuk Valley National Park is 688,000 ha (1.7 million ac) in size and includes one wild and scenic river and 77,000 ha (190,000 ac) of wilderness. NPS has proposed an additional 168,000 ha (414,720 ac) be set aside as wilderness. Regional residents account for more than 90% of park use. NPS estimates that out-of-region recreational

use is limited to about 25-75 users per year. Most out-of region visitors fly in their own planes to sport fish at the mouth of the Salmon River and other tributaries of the Kobuk River. Local boats can be chartered for fishing. Lodges in Ambler and Shungnak accommodate a small number of visitors. There are reported instances of subsistence and sport fish user conflicts on the Kobuk River (see NPS 1986a).

2. Gates of the Arctic National Park and Preserve consists of 2.939 million ha (7.263 million ac) of combined park and wilderness lands and 42,000 ha (103,932 ac) of park lands only. The park also includes six wild and scenic rivers. Recreational fishing is mostly for Arctic grayling, Dolly Varden and lake trout, with the most heavily used areas being Walker and Chandler lakes⁸. Two lodges on Walker Lake, at the headwaters of the Alatna River, advertise sport fishing opportunities, and local air-taxi operators drop off anglers at other areas. Sport fishing mostly occurs in conjunction with other activities such as river running, hunting and backpacking (see NPS 1985a).
3. Cape Krusenstern National Monument was created in 1980 to protect archaeological sites, preserve prehistoric and historic Native cultures, protect habitat for fish and wildlife and protect the viability of subsistence resources. The NPS directs management of the monument which is 267,000 ha (659,807 ac) in size. Access and development restrictions of park lands apply to monument lands. Fishing for whitefish, ciscos, Arctic char, chum salmon and northern pike is primarily by subsistence users. Recreational use of the monument is extremely limited and occurs mostly in conjunction with subsistence activities (NPS 1985b).
4. Noatak National Preserve is 2.63 million ha (6.5 million ac) in size, and includes one Wild and Scenic River and 2.35 million ha (5.8 million ac) of designated wilderness land. It is also a UNESCO Biosphere Reserve, designed to maintain genetic pools. Recreational use is estimated at 2,000 to 2,500 visitors per year, who participate in river running, hunting and sport fishing. Arctic grayling and Dolly Varden are the most common sport fish. About 25 commercial operators provide air and guiding service. Popular drop off points for sport fishing include the Kelly and Cutler Rivers. Construction of a State hatchery (Sikusuilak Creek) in the Lower Noatak River has caused some concern on the part of NPS regarding maintenance of the chum salmon gene pool as expressed in the Biosphere Reserve philosophy (NPS 1986b).
5. Bering Land Bridge National Preserve consists of 1.127 million ha (2.8 million ac), with 90% of use related to subsistence and local use activities. NPS has proposed that an additional 121,000 ha (299,520 ac) of the Preserve be designated as Wilderness. Very

⁸ Rodney Simmons. 1988. Personal Communication. USFWS, Fisheries Services, 101 12th Ave., Box 20, Fairbanks, AK 99701.

little sport fishing occurs in the Preserve because better fishing opportunities are available on the Seward Peninsula outside of the Preserve (NPS 1986c).

6. Yukon-Charley Rivers National Preserve is 1.023 million ha (2.53 million ac) in size and includes the Charley River and its main tributaries as a Wild and Scenic River. NPS has proposed that 442,380 ha (1,093,120 ac) be designated as Wilderness. Sport fishing is primarily for Arctic grayling, with northern pike found in lower tributary streams and Dolly Varden char found in one tributary (NPS 1985c).

A General Management Plan for each unit (except the Yukon-Charley River National Preserve which was completed in 1985) was completed by the NPS in 1987 after taking public and state agency input. General Management plans are intended to establish management direction, determine public access policies, and allowable public uses including priorities for fisheries research within each park unit. It is intended that supplemental plans will be developed in subsequent years to deal with specific fisheries projects, public uses, and access problems.

National Wildlife Refuges:

Refuges are mandated to conserve fish and wildlife habitat, fulfill international treaty obligations, provide for continued subsistence opportunities and ensure water quality. Each refuge has specific legislative purposes and although each is regulated by federal law, the USFWS recognizes a master memorandum of understanding with the State of Alaska which vests primary responsibility for fish and wildlife management with the state, unless subsistence opportunities are compromised. Refuge managers review and adopt ADFG management plans unless the plans are formally determined to be incompatible with the purposes of the refuge. Different management goals exist for each refuge. Policy ranges from that of minimal interference with human use, to that of promotion of increased Wilderness and Wild and Scenic River designations. All guides and outfitters are required to have special use permits. There are seven National Wildlife Refuges (NWR) in AYK, and a summary of each follows. Comprehensive Conservation Plans (available from U.S. Fish and Wildlife Service) were completed for all refuges except the Yukon Delta NWR and Arctic NWR in 1987. The plans contain detailed information on the environment and management alternatives, as well as maps for each unit. Step-down plans, more specific plans for fisheries, river management, and other public uses of the lands and their resources, will be completed in subsequent years.

1. Selawik NWR is 890,327 ha (2.2 million ac) in size and includes one Wild and Scenic River and 97,126 ha (240,000 ac) of Wilderness lands. The preferred management alternative is for minimal interference. Mechanized travel to any in-holdings, oil and gas studies and recreational opportunities would be allowed. Recreational use levels are extremely low, with most sport fishing targeting on sheefish in the Kobuk River, adjacent to the NWR (USFWS 1986).

2. Yukon Delta NWR is the largest of Alaska's 16 refuges and consists of 10.52 million ha (26 million ac) including two Wild and Scenic Rivers and 769,000 ha (1.9 million ac) of Wilderness lands. The management plan permits oil and gas leasing on only 3% of the refuge. Habitat and population manipulation may be conducted on some of the lands. Most sport fishing occurs on the Kisaralik River, but increasing interest from Togiak fishing guides in establishing commercial guiding on the Andreafsky and Kwethluk rivers and other refuge rivers has been expressed. Rainbow trout are found in the Kwethluk, Kasigluk, Kisaralik, Tuluksak, and Aniak rivers. Sport harvest of sheefish has increased and large numbers of northern pike are caught by locals in the winter. If sport fish guiding increases, the refuge staff envisions conflicts with subsistence users and plans to launch an extensive monitoring program (USFWS 1987a).
3. Yukon Flats NWR is 4.53 million ha (11.2 million ac) in size, has two Wild and Scenic Rivers, and borders the Trans-Alaska pipeline. The management plan directs minimal disturbance of habitat and increased wilderness land designations. Limited fly-in sport fishing exists and is mostly incidental to hunting and river running. The Dall River receives the heaviest sport fishing pressure, due to access from the Dalton Highway (USFWS 1985).
4. Koyukuk and Innoko NWR are 1.82 and 0.283 million ha (4.5 and 0.7 million ac) in size, respectively. The management plan calls for minimal management. Staff has little information on sport fishing, but believes some occurs in conjunction with hunting and river running (USFWS 1987c).
5. Nowitna NWR consists of 809,389 ha (2 million ac) and one Wild and Scenic River. The management plan is for minimal management. Sport fishing for trophy sheefish is an established activity on the Nowitna River. Northern pike are also sought by anglers. It is believed that most sport fishing occurs in conjunction with hunting (USFWS 1987b).
6. Kanuti NWR is 647,511 ha (1.6 million ac) in size. The management plan emphasizes the restoration of fish populations to natural and healthy levels. The plan also strives to increase fishing opportunities, but would designate no wilderness areas, and would allow some oil and gas studies (USFWS 1987d).
7. Arctic NWR consists of 7.9 million ha (19.5 million ac), four Wild and Scenic Rivers and 3.24 million ha (8 million ac) of wilderness lands. The management plan maintains the existing range and intensity of management and recreational economic uses. Opportunities for fishing and other public uses would be maintained, as would scientific research. Most sport fishing for Arctic grayling, Arctic char, lake trout and northern pike occur in conjunction with river trips and hunting (USFWS 1988). Float trips

on refuge rivers of both the North and South Slope are a recognized and growing popular use. The Kongakut River on the North Slope is considered most popular, followed by the Hulahula and Canning rivers. The Ivishak and Sagavanirktok rivers are also sometimes used by float parties. The Sheenjek and Porcupine rivers are the most popular south slope rivers for this purpose (USFWS 1988).

Wild and Scenic Rivers:

In the AYK Region, 14 rivers in national parks, preserves and refuges, and 5 rivers outside federal conservation units, have been placed within the national wild and scenic river system. The Wild and Scenic Rivers Act of 1968 stipulates that these rivers shall be preserved in free flowing condition, generally free of impoundments, and have primitive shorelines and watersheds. The wild and scenic river designation positively impacts utilization of the sport fish resource by affording anglers the possibility of a pristine and uncrowded fishing experience. Access to rivers is controlled and facilities are restricted, thus potentially precluding the development of fishing lodges among other uses. Wild and scenic rivers in the AYK Region are listed in Appendix A.

Wilderness Land Designations:

The Wilderness Act of 1964 restricts modes of access and development on designated parcels of land. Wilderness land designation is intended to promote solitude and primitive recreational opportunities. Depending upon interpretation of the wilderness modifications in ANILCA, land managers may restrict the use of power chain saws, generators, and other similar motors. Stream clearance, weir construction, and field camp operations in wilderness areas⁹ in support of fisheries field research may be restricted, depending upon circumstances.

Natural Factors Affecting Sport Fisheries

Natural catastrophic events (timing and severity of natural phenomena) affect sport fish habitat and life history. Known natural occurrences in 1987 are described and their impacts on sport fish are discussed in the following paragraphs.

Fires:

Fires and fire suppression measures by agencies such as the BLM and State of Alaska Division of Forestry are common during the summer months and during particularly dry and warm years, forest and tundra fires are a major feature of the climate in Interior and Northern Alaska. Fires in Alaska generally do not penetrate the duff layer to mineral soil and thus do not represent a great potential erosion problem. In addition, frozen ground in large areas of the

⁹ Artina Cunning. 1988. Personal Communication. ADFG, Division of Wildlife Conservation, PO Box 1148, Nome, AK 99762.

Arctic and Interior assists in curtailing fire-induced soil erosion¹⁰. Major impacts of fire on fisheries can occur with the use of earth moving equipment by fire fighters to prevent enlargement of a blaze, and aerial deployment of fire retardant. BLM has strict guidelines regarding fire retardant use near water bodies. BLM personnel state that the retardant presently in use is biodegradable and if mistakenly introduced into a water body, would have minimal and short-lived impact on fish populations¹¹. Thus, it is the BLM position that fires in Alaska pose no significant direct impacts to fish populations.

The 1987 fire season was not as severe as expected from snow pack, spring temperature and precipitation data. A total of 264 unique fire numbers were assigned by the Alaska Fire Service (FAS). A total of 67,463 ha (166,796 ac) burned in 1987, compared to 159,763 ha (395,000 ac) in 1986 (5 year average acreage is 82,175 ha (203,171 ac), USDA 1987). Four fires, each larger than 4,045 ha (10,000 ac) in area burned accounted for 42,873 ha (106,000 ac) of the total burned (USDA 1987).

Snowpack Assessment:

Snowpack depth and duration impacts fish life history by influencing such factors as water level, sunlight penetration, and insulation of water bodies in periods of extreme cold. Snow survey data obtained from the Soil Conservation Service (USDA 1987) provided snowpack summaries for water year 1987 by region. (Water year 1987, hereafter referred to as WY 1987, is the period of time from October 1, 1986 through September 1987).

In the Arctic, winter snow accumulation was below average as of May, 1987. In the Upper Yukon Basin, the snowpack at the headwaters of the Yukon River was about average with a snow water equivalent (SWE) value of about 13.2 cm, while SWE in the Central Yukon averaged 6.7 cm in April and was below average. Breakup was earlier than normal in the Tanana Basin, where the SWE was about 5.3 cm in April compared to the average of about 8 cm. Temperatures were well above normal from December through April. In the Koyukuk and Lower Yukon River areas, SWE was about average, but air temperatures from December through April were well above average. In the Kotzebue Region, snowfall was well above normal, while in the Norton Sound Basin, it was near normal. Kuskokwim area winter snowfall was approximately normal, with above normal air temperatures from December through April.

Stream Discharge Assessment:

Stream flows have a significant impact on fish life history, especially maximum stream discharge events. Stream discharge records were obtained from the U.S. Geological Survey (Vaill et al. 1988) which give monthly and yearly mean and extreme discharge data by river (Table 15).

¹⁰ Dale Haggstrom. 1988. Personal Communication. ADFG, Division of Wildlife Conservation, 1300 College Rd., Fairbanks, AK 99701.

¹¹ Mark Jones. 1988. Personal Communication. BLM, Alaska Fire Service, PO Box 35005, Ft. Wainwright, AK 99703.

Table 15. Gaging station records^a of mean and maximum discharge^b for 1987, and mean and maximum for the period of record, for eleven rivers in AYK.

River	1987		Period of Record		
	Mean	Max	Mean	Max	Years
Kuskokwim at Crooked Cr	41.1	130.0	40.9	392.0	1951-87
Yukon at Eagle	85.2	339.0	82.9	545.0	1950-87
Yukon at Pilot Station	223.8	638.0	223.7	1,100.0	1975-87
Tanana at Fairbanks	18.6	92.4	19.4	96.4	1973-87
Chena at Fairbanks	1.1	6.7	1.4	74.4	1948-87
Salcha near Salchaket	1.3	7.9	1.7	97.0	1948-87
Koyukuk:					
Middle Fk near Wiseman ^c	1.1	11.1	0.8	19.1	1970-87
Snake near Nome	1.2	1.3	0.2	4.2	1965-87
Kobuk near Kiana	11.4	45.0	14.9	152.0	1976-87
Wulik near Kivalina	0.5	7.9	--	15.6	1984-87
Kuparuk near Deadhorse	1.2	15.0	1.3	118.0	1971-87
Sagavanirktok, Pump 3	1.7	11.8	1.3	23.0	1982-87

^a Data from Vaill et al. 1988

^b Cubic feet per second x 1,000.

^c Excluding year 1979-1982.

Of the streams in the AYK Region for which discharge data are collected, several (Table 15) had mean discharge rates in 1987 that exceeded the annual mean discharge of all years of record. However, maximum discharges in 1987 at those locations did not approach the maximum recorded flows. Maximum discharge in 1987 of the Tanana River at Fairbanks approached the maximum recorded value of 96,400 cubic feet per second. In all the other monitored stream sites, maximum discharge values for WY 87 did not approach or exceed maximum recorded levels. The flooding and streambed disruption noted during the summer of 1986 in Tanana drainage streams did not occur in 1987.

Mean Air Temperature and Precipitation:

Mean monthly temperature impacts fish life history by timing stream freeze up and break up occurrences, influencing the duration and severity of the seasons, and acting in conjunction with precipitation, affecting water level. Climatological data for four major cities in AYK (Fairbanks, Nome, Kotzebue and Barrow) were obtained from the US Weather Service (NOAA 1987). The mean monthly and yearly temperature (F) and precipitation (inches) for the period of record (1958-1987) are provided by this source. Climatological data from only four locations may not adequately represent microclimatic conditions throughout the region, but the data give an indication of regional seasonal weather patterns.

Mean monthly air temperatures in WY 1987 for the four cities followed a similar pattern to the period of record, except that all cities exhibited slightly higher temperatures in the winter months of 1986-1987 than the period of record. In addition, mean monthly air temperatures in July for three of the four cities exceeded those means for the period of record (Figure 25).

Mean monthly precipitation in WY 1987 for the four cities from about January through June was less than the mean for the period of record. In contrast, mean monthly precipitation in August for Kotzebue, Nome and Barrow significantly exceeded the mean for the period of record (Figure 26).

ACKNOWLEDGEMENTS

The authors thank John H. Clark for suggesting the preparation of this report and for his continued support of it. Thanks also to members of the region III staff, including Mike Doxey, Robert Clark, Margaret Merritt and John Clark for responding generously to requests for assistance.

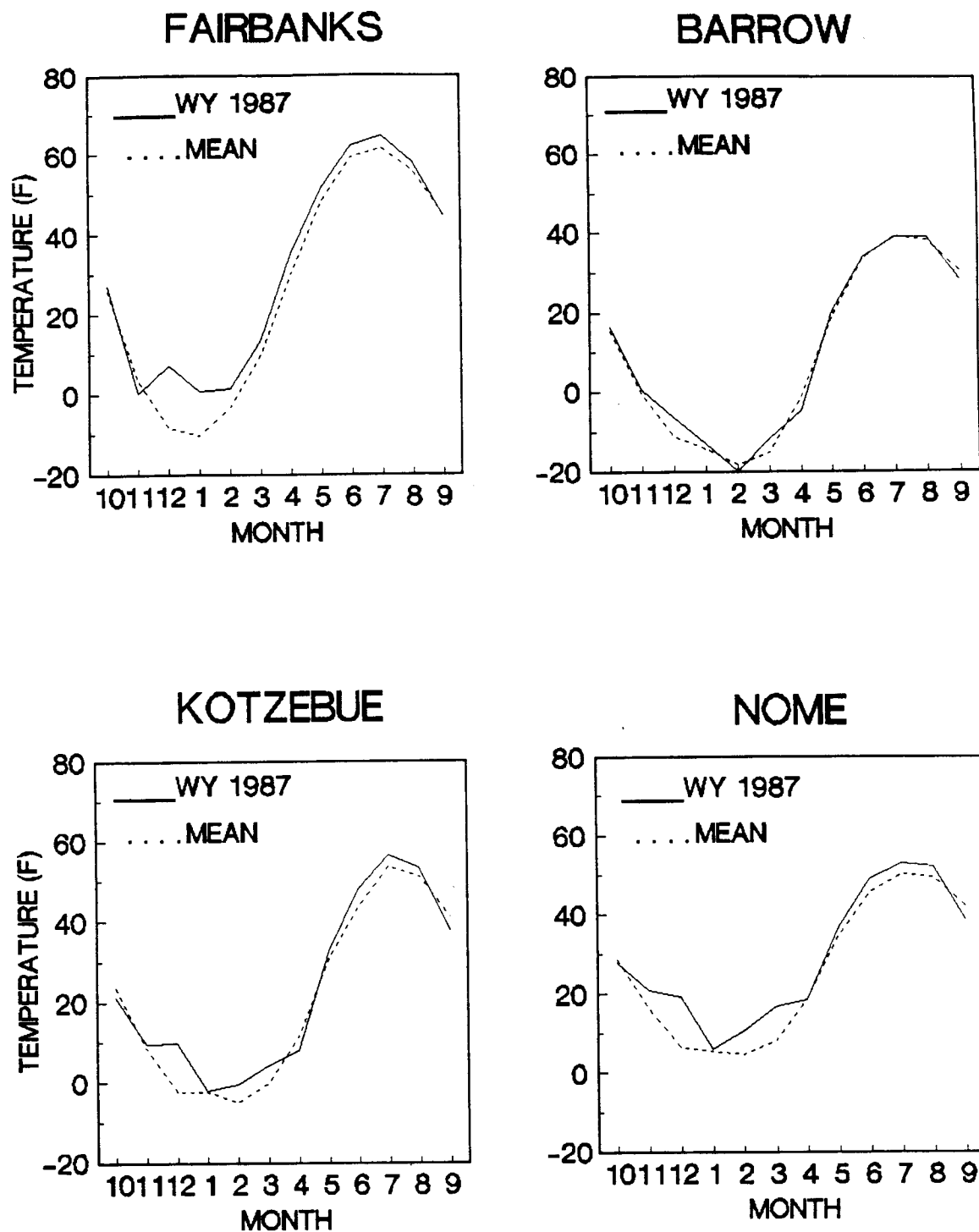


Figure 25. Monthly mean air temperature for the 1987 water year compared to monthly mean air temperature, 1958-1987, in four AYK locations.

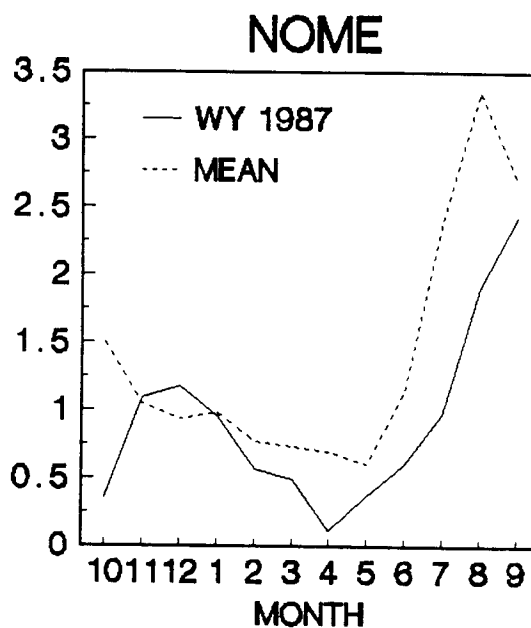
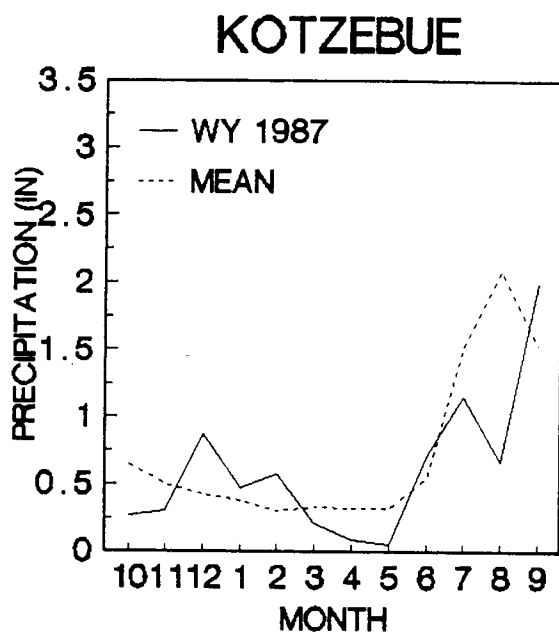
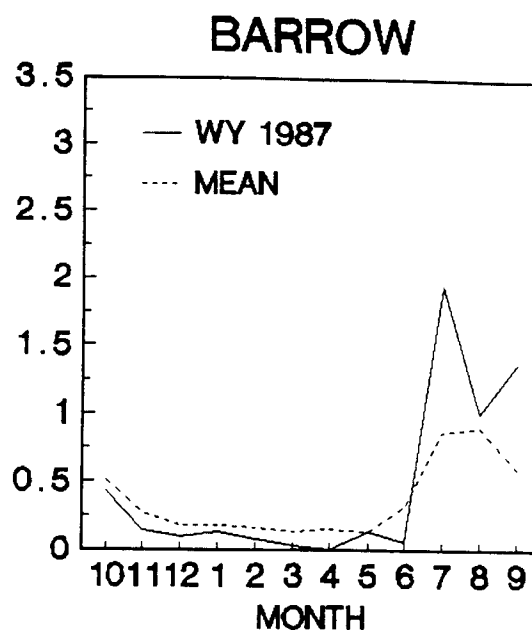
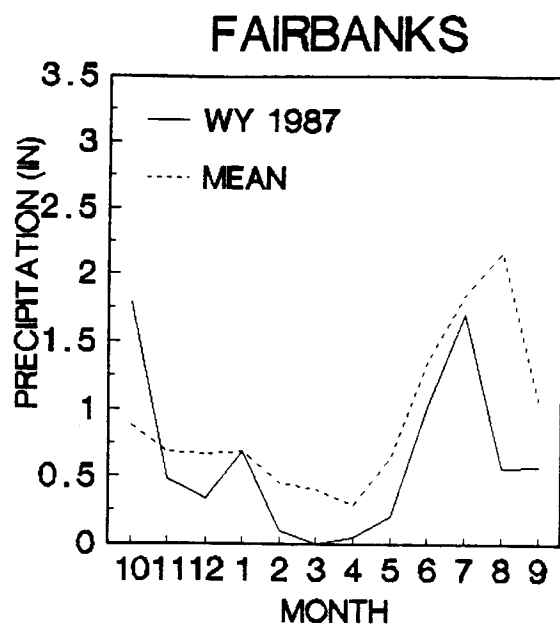


Figure 26. Mean monthly precipitation for the 1987 water year compared to mean monthly precipitation, 1958-1987, in four AYK locations.

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Appendix A

WILD AND SCENIC RIVERS IN THE AYK REGION

Appendix A. National Wild and Scenic Rivers in the Arctic Yukon Kuskokwim Region.

River	Federal Unit or Area
Alatna	Gates of the Arctic National Park
John	Gates of the Arctic National Park
Kobuk	Gates of the Arctic National Park
Upper Noatak	Gates of the Arctic National Park
North Fork of the Koyukuk	Gates of the Arctic National Park
Tinayguk	Gates of the Arctic National Park
Salmon	Kobuk Valley National Park
Charley	Yukon-Charley Preserve
Upper Selawik	Selawik National Wildlife Refuge
Andreafsky and East Fork	Yukon Delta National Wildlife Refuge
Nowitna (a 357 km section)	Nowitna National Wildlife Refuge
Ivishak	Arctic National Wildlife Refuge
Upper Sheenjek	Arctic National Wildlife Refuge
Wind	Arctic National Wildlife Refuge
Upper Unalakleet	Norton Sound
Upper Beaver Creek	Interior Alaska
Birch Creek	Interior Alaska
Delta	Interior Alaska
Fortymile	Interior Alaska

APPENDIX B

AYK AREA SPORT FISHING REGULATIONS SUMMARY FOR 1987,
INCLUDING CHANGES MADE AFTER PUBLICATION
OF REGULATION BOOKLETS

ARCTIC—YUKON—KUSKOKWIM AREA

This is a summary of the official regulations codified in 5 AAC 70.001-050 which are available for inspection at libraries, department offices, and Department of Public Safety offices throughout the state.

The Arctic—Yukon—Kuskokwim area consists of all waters of Alaska, including the Bering Sea, Chukchi Sea, and Arctic Ocean drainages, north of a line extending west from Cape Newenham, and west of the International Boundary near Demarcation Point.

INSTRUCTIONS:

1. Find the water (alphabetically listed) that you intend to fish. If the water, or any portion of it, is not listed, the regulations in the shaded entry apply.
2. Use the Code Key to determine open season, catch, and length limits. Read Special Regulations.
3. An asterisk(*) denotes Special Regulations apply.



SEASON AND CATCH LIMIT

WATER AND SPECIAL REGULATIONS

	SALMON	RAINBOW TROUT/ GRAYLING/CHAR	SHEEPSH	PIKE	HALIBUT	OTHER
All waters not listed below	A,B	F,H	L	O	P	R
All waters between Paxson and Cantwell: (see also page 11) south of the Denali Highway, and the Summit and Paxson Lake drainages north of the Denali Highway and south of the Tanana River, excluding Summit and Paxson Lake drainages Special Regulations: *Only 15 burbot daily and in possession.		I,K,Q G,I,J,Q				R* R
Beaufort Sea drainages between Point Barrow and Demarcation Point	E	E	L	O		R
Chena River drainage: upstream from a department marker 300 feet downstream from the Chena River flood control structure remainder of drainage Special Regulations: See Tanana River drainage Special Regulations.	Closed C,D	J J	M M	N N		R R
Fielding Lake Special Regulations: *Burbot may be taken by set line from October 15 through May 15.		I,J				R*
Goodpastor River drainage Special Regulations: See Tanana River drainage Special Regulations.	Closed	J	M	N		R
Nome River Special Regulations: *For salmon other than king salmon, the bag and possession limit is 15, only 5 of which may be chum and coho salmon, in combination.	A,B*	F				R

ARCTIC-YUKON-KUSKOKWIM AREA

SEASON AND CATCH LIMIT

WATER AND SPECIAL REGULATIONS

	SALMON	RAINBOW TROUT/ GRAYLING/CHAR	SHEEFISH	PIKE	HALIBUT	OTHER
Salcha River: downstream from the confluence with Redmond Creek upstream from the confluence with Redmond Creek Special Regulations: Fishing from the Richardson Highway bridge over the Salcha River is prohibited. See Tanana River drainage Special Regulations.	C,D Closed	J J	M M	N N		R R
Salmon Lake (Seward Peninsula), its tributaries, and the outlet stream 300 feet downstream from the lake outlet	Closed	F				R
Snake River (near Nome) Special Regulations: *For salmon other than king salmon the bag and possession limit is 15, only 5 of which may be chum and coho salmon, in combination.	A,B*	F				R
Tanana River drainage: (excluding the waters between Paxson and Cantwell south of the Denali Highway which are specified elsewhere in this list) Special Regulations: Spears may be used to take pike from October 1 through May 31 and to take burbot from September 1 through December 31. Spears and bow and arrow may be used to take whitefish from September 1 through March 31. All ice houses must be registered and a permit secured from the department. Each house must have permit numbers displayed on its side and roof in distinguishable numbers not less than 12 inches in height.	C,D	G,I,J,Q	M	N		R
Trans-Alaska Pipeline (a corridor 5 miles wide on each side of the alignment): Yukon River to Brooks Range Divide Brooks Range Divide to Prudhoe Bay Special Regulations: *Closed to salmon fishing.	Closed Closed	F *E	Closed Closed	0 0		R R

OTHER ARCTIC—YUKON—KUSKOKWIM AREA REGULATIONS

METHODS AND MEANS. In all lakes, multiple hooks with gap between point and shank greater than one-half inch may be used for taking fish other than salmon. Burbot, pike and whitefish may be taken by underwater spear in all lakes by persons completely submerged.

CODE KEY: ARCTIC-YUKON-KUSKOKWIM AREA Use these codes to determine open season, catch and length limits.

CODE		OPEN SEASON	BAG, POSSESSION, AND SIZE LIMITS
A	KING SALMON	Entire Year	5 per day, 5 in possession, no size limit
B	OTHER SALMON	Entire Year	10 per day, 10 in possession, no size limit
C	KING SALMON	Entire Year	1 per day, 1 in possession, no size limit
D	OTHER SALMON		
	16 inches or more	Entire Year	3 per day, 3 in possession
	less than 16 inches	Entire Year	10 per day, 10 in possession
E	SALMON, CHAR, GRAYLING	Entire Year	10 per day in any combination, 10 in possession only 2 over 20 inches
F	GRAYLING & CHAR	Entire Year	15 per day in combination, 30 in possession, only 3 per day and 6 in possession over 20 inches
G	RAINBOW TROUT	Entire Year	20 inches or more, 2 per day, 2 in possession Less than 20 inches, 10 per day, 10 in possession
H	RAINBOW TROUT	Entire Year	2 per day, 2 in possession, no size limit
I	LAKE TROUT	Entire Year	20 inches or more, 2 per day, 2 in possession Less than 20 inches, 10 per day, 10 in possession
J	GRAYLING	Entire Year	5 per day, 10 in possession, no size limit
K	GRAYLING	Entire Year	10 per day, 10 in possession, no size limit
L	SHEEFISH	Entire Year	10 per day, no possession limit, no size limit
M	SHEEFISH	Entire Year	2 per day, 2 in possession, no size limit
N	NORTHERN PIKE	Entire Year	30 inches or more, 2 per day, 2 in possession Less than 30 inches, 10 per day, 10 in possession
O	NORTHERN PIKE	Entire Year	No bag, possession or size limit
P	HALIBUT	February 1 - December 31	2 per day, 2 in possession, no size limit
Q	ARCTIC CHAR	Entire Year	10 per day, 10 in possession, no size limit
R	OTHER FISH	Entire Year	No bag, possession or size limit

NOTE: Unless indicated more specifically, char means all char including Dolly Varden, Arctic char and lake trout.

REGULATION CHANGES¹ FOR TANANA DRAINAGE WATERS

GRAYLING
TANANA DRAINAGE

- A. Daily Bag And Possession Limit is 5 Grayling
- B. Closed Seasons:
1. Chena River Drainage, Delta Clearwater River drainage, and the Richardson Clearwater River drainage:

Closed to Grayling Fishing April 1 through June 5
 2. Shaw Creek drainage, and the Tanana River from 1/2 mile upstream of the mouth of Shaw Creek downstream to the mouth of Tenderfoot Creek:

Closed to All Fishing April 3 through June 5
- C. Size Limits:
1. Chena River drainage, Delta Clearwater River drainage, Richardson Clearwater River drainage, Shaw Creek drainage, and Piledriver Slough:

12 Inch Minimum Length Limit
- D. Gear Restrictions:
1. Chena River drainage upstream of the Chena River Dam, Delta Clearwater River drainage, Richardson Clearwater River drainage, Shaw Creek River drainage upstream of the Richardson Highway bridge, and Piledriver Slough:

Only Artificial Flies and Lures (No Bait) May Be Used
 2. Chena River drainage downstream from the Chena River Dam, Shaw Creek downstream from the Richardson Highway bridge, and the Tanana River within 2 miles of the mouth of Shaw Creek:

Bait May Be Used Only On Hooks With A Gap Greater Than 3/4 Inch

CHINOOK (KING) SALMON
TANANA RIVER DRAINAGE WATERS

- A. Daily Bag And Possession Limit:
1. For Chinook Salmon greater than 16 inches:

1 Fish
 2. For Chinook Salmon less than 16 inches:

10 Fish

¹ Changes effective following publication of the regulation booklet

APPENDIX C

PROVISIONAL AND PERMANENT EMERGENCY REGULATIONS
FOR SPORT FISHING IN THE AYK REGION ADOPTED BY
THE DEPARTMENT IN 1987

FINDING OF EMERGENCY

The Alaska Department of Fish and Game finds that an emergency exists and that the attached regulations are necessary for the immediate preservation of the public peace, health, safety, or general welfare. A statement of the facts constituting the emergency is:

The Board of Fisheries adjourned their December 1986 meeting earlier than scheduled with the premature resignation of three of its members. Several proposals to regulate the sport harvest of severely depressed Tanana drainage grayling stocks and to allow the sport harvest of stocked landlocked chinook salmon in Tanana River drainage lakes were scheduled for consideration by the board, but were not addressed due to the early adjournment. The board was unable to schedule consideration of these issues during their April 1987 meeting.

Biological data indicate that several grayling populations are being overharvested with severe impacts occurring to these stocks. Exploitation rates in these grayling fisheries over the past few years have been as high as 50%, whereas, biologically acceptable exploitation rates for grayling stocks average about 15%. Continuing downward trends in grayling stock abundance have occurred for several years, with last season's population abundance being an all time low for most affected grayling populations. It is appropriate to adjust fishing seasons, means and methods, and possession limits for these grayling fisheries at this time to insure stock conservation, while still allowing some harvest to occur.

In the case of landlocked chinook salmon populations created by the state stocking program, the bag limit is so restrictive that these landlocked chinook stocks are significantly under utilized. These stocked chinook salmon cannot spawn and conservation of these stocks is not a concern. Without an increased bag limit, stocked chinook salmon will remain largely unharvested and the resource will be lost due to natural mortality resulting in waste of hatchery-produced fishery resources.

ADOPTION ORDER

Under authority of AS 16.05.251 and AS 16.05.270, the regulations are adopted as emergency regulations to take effect immediately upon filing by the Lieutenant Governor as provided in AS 44.62.180(3).

This action is not expected to require an increased appropriation.

DATE: _____

Juneau, Alaska

Don W. Collinsworth, Commissioner

Alaska Department of Fish and Game

FILING CERTIFICATION

I, Stephen McAlpine, Lieutenant Governor for the State of Alaska,
certify that on April ____, 1987, at ____ .m., I filed the attached
regulations according to the provisions of AS 44.62.

Lieutenant Governor

Effective: _____

Register: _____

Register _____, _____ 1987

FISH & GAME

5 AAC 70.020.

CHAPTER 70.

ARCTIC-YUKON-KUSKOKWIM AREA

5 AAC 70.020 (b) is amended and (g) is added to read:

5 AAC 70.020. BAG LIMITS, POSSESSION LIMITS, AND SIZE LIMITS.

(b) Except as provided in (c), (f), and (g) of this section, in the Tanana River drainage, bag limits, possession limits, and size limits are as follows:

	Bag Limit	Possession Limit	Size
King Salmon			
16 inches or more	1	1	
less than 16 inches	10	10	
Other Salmon			
16 inches or more	3	3	
less than 16 inches	10	10	
Rainbow Trout			
20 inches or more	2	2	
less than 20 inches	10	10	
Lake Trout	2	2	Minimum legal size is 18 inches
Burbot in lakes	5	5	None
Grayling	5	5	None
Sheefish	2	2	None
Char	10	10	None
Northern Pike			
30 inches or more	2	2	
less than 30 inches	10	10	

Other fish No bag, possession, or size limits.

(g) In the Shaw Creek drainage, Chena River drainage, Delta Clearwater River drainage, Richardson Clearwater River drainage, and in Piledriver Slough upstream of its confluence with Moose Creek, the minimum legal size for grayling is 12 inches. (In effect before 1983; am 4/3/83, Register 85; am 5/11/85, Register 94; am __/__/87, Register __)

Authority: AS 16.005.251

Register _____, _____ 1987

FISH & GAME

5 AAC 70.035.

5 AAC 70.050

5 AAC 70.035 (g) and (h) are added to read:

5 AAC 70.035. METHODS AND MEANS.

(g) Only unbaited artificial lures or flies may be used in the Delta Clearwater River drainage, the Richardson Clearwater River drainage, Chena River drainage upstream of the Chena River Dam, Piledriver Slough upstream of its confluence with Moose Creek, and the Shaw Creek drainage upstream of the Richardson Highway Bridge.

(h) Bait may be used only on hooks with a gap size larger than 3/4 of an inch in the Chena River drainage downstream of the Chena River Dam, in Shaw Creek downstream of the Richardson Highway Bridge, and in the Tanana River within two miles of the mouth of Shaw Creek. (In effect before 1985; am 5/11/85, Register 94; am __/__/87, Register __)

Authority: AS 16.05.251

5 AAC 70.050 (f) is added to read:

5 AAC 70.050. WATERS CLOSED TO SPORT FISHING.

(f) The following waters are closed to grayling fishing from April 1 to the first Saturday in June: Chena River drainage, Delta Clearwater River drainage, Richardson Clearwater River drainage, Shaw Creek drainage, and the Tanana River within two miles of the mouth of Shaw Creek. (In effect before 1985; am 5/11/85, Register 94; am __/__/87, Register __)

Authority: AS 16.05.251

NOTICE OF ADOPTION OF EMERGENCY REGULATION

As required by AS 44.62.250, notice is here by given that, under the authority of AS 16.05.251 and AS 16.05.270, the Department of Fish and Game adopted or amended on this date, as emergency regulations 5 AAC 70.020(b) and (g), 5 AAC 70.035(g), and 5 AAC 70.050(f) for the Tanana River Drainage, which change the sport fishing king salmon and grayling bag and possession limits, establishing a size limit and gear for grayling, and closes selected waters to grayling fishing.

This action is not expected to require an increased appropriation.

Copies of this regulation may be obtained by writing to the Department of Fish and Game, P.O. Box 3-2000, Juneau, Alaska, 99802, or by contacting local department offices in Delta and Fairbanks.

Notice is also given that the Department of Fish and Game intends to make this regulation permanent under AS 44.62.260, and any person interested may present written statements or arguments relevant to the action by writing to the Commissioner, Department of Fish and Game, P.O.

Box 3-2000, Juneau, Alaska, 99802, so that they are received no later than 4:30 p.m., May 15, 1987.

Date: _____

Juneau, Alaska

Don W. Collinsworth, Commissioner

Department of Fish and Game

STATE OF ALASKA)
) ss.
FIRST JUDICIAL DISTRICT)

AFFIDAVIT OF NOTICE OF ADOPTION
OF EMERGENCY REGULATIONS

I, Don W. Collinsworth, Commissioner of the Department of Fish and Game,
being sworn, state the following:

As required by AS 44.62.250, notice (April 1_, 1987) of the adoption and amendment of 5AAC 70.020, 5AAC 70.035, and 5AAC 70.050 relating to the Tanana River sport fishery king salmon and grayling bag and possession limits, grayling size limit and gear, and waters closed to grayling fishing as emergency regulations by the Department of Fish and Game have been given in accordance with AS 44.62.190(a) by

- (1) being published in a newspaper or trade publication;
- (2) being mailed to interested persons
- (3) being mailed or delivered to appropriate state officials;
- (4) being furnished to the Department of Law;
- (5) being furnished to incumbent State of Alaska legislators and the Legislative Affairs Agency;
- (6) being furnished to the Resource Committees of the Alaska Senate and House of Representatives;
- (7) being furnished to the staff of the Administrative Regulation Review Committee.

(8) being furnished to the lieutenant governor for publication in
the Alaska Administrative Journal.

DATE: _____

Juneau, Alaska

Don W. Collinsworth, Commissioner
Department of Fish and Game

SUBSCRIBED AND SWORN TO before me _____, 19____

Notary Public in and for Alaska

My commission expires: _____

MEMORANDUM

State of Alaska

TO: Peter B. Froehlich
Assistant Attorney General and
Regulations Attorney
Department of Law

DATE: April 9, 1987

FILE NO.:

THRU:

TELEPHONE NO.: 465-4110

SUBJECT: Emergency Regulations-
Lake Trout and Burbot
(5 AAC 52 & 70)

FROM: Beth Stewart
Executive Director
Division of Boards
Department of Fish and Game

Enclosed is a legal notice stating that the department intends to make the subject emergency regulations permanent. It is our intent not to change these regulations at this time under this legal notice. We will be filing another set of Sport Fishing emergency regulations for the same areas about mid-May. At that time we will publish and distribute a more comprehensive legal notice allowing the department more latitude in regulating these fisheries. It is probably not worthwhile opening a file on this project at this time.

Enclosure

cc: Larri Spengler
Lou Bandirola
Bob Clasby
John Clark
Paul Krasnowski

NOTICE OF INTENT TO MAKE EMERGENCY REGULATION PERMANENT

As required by AS 44.62.250, notice was given that, under the authority of AS 16.05.251 and AS 16.05.270, the Department of Fish and Game, on February 5, 1987, adopted emergency regulations lowering the sport fishing bag and possession limits for lake trout and burbot for lakes in the Arctic-Yukon-Kuskokwim Area (5 AAC 70), and established a minimum legal size for lake trout and reduced the number of hooks for the taking of burbot in the Upper Copper River and Upper Susitna River Area (5 AAC 52) and in the Arctic-Yukon-Kuskokwim Area (5 AAC 70).

Notice is now given that the Department of Fish and Game intends to make these regulations permanent under AS 44.62.260, and any person interested may present written arguments relative to the action by writing to the Commissioner, Department of Fish and Game, P.O. Box 3-2000, Juneau, Alaska, so that they are received no later than 4:30 p.m. May 15, 1987.

This action is not expected to require an increased appropriation.

Copies of this regulation may be obtained by writing to the Department of Fish and Game, P.O. Box 3-2000, Juneau, Alaska, 99802, or by contacting local department offices in Anchorage, Palmer, Glennallen, Delta and Fairbanks.

DATE: _____
Juneau, Alaska

Don W. Collinsworth, Commissioner
Department of Fish and Game

MEMORANDUM

STATE OF ALASKA


TO: Larri Irene Spengler
Assistant Attorney General
Department of Law

DATE: September 24, 1987

FILE NO.: 993-87-0158

THRU:

TELEPHONE NO.: 465-4180

FROM: 
Frank Van Hulle, Deputy Director
Division of Sport Fisheries
Alaska Department of Fish and Game

SUBJECT: Emergency Regulations
5 AAC 52 and 70 Lake
Trout and Grayling
Made Permanent

Please find attached the corrected copies of 5 AAC 52 and 70 regulations that the department wishes to make permanent.

We appreciate your assistance in making these revisions.

cc: Elizabeth Stewart, Director
Division of Boards

Bob Clasby, Regulations Specialist
Division of Commercial Fisheries

John Clark, Regional Supervisor
Division of Sport Fisheries

Paul Krasnowski, Regional Supervisor
Division of Sport Fisheries

Enclosures

Register __, __ 1987

FISH & GAME

5 AAC 70.010

5 AAC 70.020

TITLE 5.
FISH AND GAME

CHAPTER 70

ARCTIC-YUKON-KUSKOKWIM AREA

5 AAC 70.010(C) is added to read:

5 AAC 70.010. FISHING SEASONS.

(c) Pike may be taken in the waters of the Tolovana River drainage upstream of its confluence with the Tanana River only from June 1 through October 14. (In effect before 1985; am 5/31/85, Register 94; am __/__/87, Register__)

Authority: AS 16.05.251

5 AAC 70.020(b) and (f) are amended and (h) is added to read:

5 AAC 70.020. BAG LIMITS, POSSESSION LIMITS, AND SIZE LIMITS.

(b) Except as provided in (c), (f), (g), and (h) of this section, in the Tanana River drainage, bag limits, possession limits, and size limits are as follows:

	Bag Limit	Possession Limit	Size Limit
King Salmon			
16 inches or more	1	1	
Less than 16 inches	10	10	

Register __, __ 1987

FISH & GAME

5 AAC 70.020

Other Salmon			
16 inches or more	3	3	
Less than 16 inches	10	10	
Rainbow Trout			
20 inches or more	2	2	
Less than 20 inches	10	10	
Lake Trout	2	2	None
Burbot in lakes	5	5	None
Burbot in rivers	No Limit	No Limit	None
Grayling	5	5	None
Sheefish	2	2	None
Char	10	10	None
Northern pike			
30 inches or more	2	2	
Less than 30 inches	10	10	

Other fish: No bag, possession, or size limits.

(f) In Fielding Lake and Harding Lake, the minimum legal size for lake trout is 18 inches.

(h) In Fielding Lake, Harding Lake, "T" Lake, and the Tangle Lakes system, the bag and possession limit for burbot is two fish. (In effect before 1983; am 4/3/83, Register 85; am 5/11/85, Register 94; am 2/6/87, Register 101; am 4/16/87, Register 102; am 6/19/87, Register 103; am ___/___/87, Register ___)

Authority: AS 16.05.251

Register __, __ 1987

FISH & GAME

5 AAC 70.035

5 AAC 70.050

5 AAC 70.035(e) is amended to read:

5 AAC 70.035. METHODS AND MEANS.

(e) Set lines may not be used to take burbot in Fielding Lake, Harding Lake, "T" Lake, and the Tangle Lakes system. Burbot may be taken by set lines in all other lakes in the Tanana River drainage from October 15 through May 15. In the Tanana River drainage, the total aggregated number of hooks used on set lines, closely attended gear, and ice fishing gear, as defined in 5 AAC 75.020 and 5 AAC 75.021, may not exceed 15 or the daily bag limit for burbot in the waters being fished, whichever is less. (In effect before 1985; am 5/11/85, Register 94; 4/16/87, Register 102; am __/__/87, Register __)

Authority: AS 16.05.251

5 AAC 70.050(g) is added to read:

5 AAC 70.050. WATERS CLOSED TO SPORT FISHING.

(g) The Tangle Lakes system is closed to the taking of lake trout. (In effect before 1985; am 5/11/85, Register 94; am 4/16/87, Register 102; am 6/19/87, Register 103; am __/__/87, Register __)

Authority: AS 16.05.251

APPENDIX D

PARTIAL LISTING OF WILDERNESS LODGES, GUIDING,
AND OUTFITTING OPERATIONS IN AYK

Appendix D. Partial listing of wilderness lodges, guiding, and outfitting operations in the AYK Region.

Location	Operation	Remarks
<u>Seward Peninsula/Norton Sound:</u>		
White Mtn.	Fishing lodge, guiding	Opened in 1986
Niukluk, Fish R.	Outfitters	
Unalakleet R.	1 lodge	
<u>Kuskokwim:</u>		
Tonzona R.	2 lodges	Includes hunting
Holitna R.	2 lodges, 6 guides	Includes hunting
Hoholitna R.	1 lodge	
Aniak R.	6 guides, misc. outfitters	
<u>Arctic:</u>		
Kobuk R.	a few small lodges (20 guests) ^a	
Walker Lk.	1 lodge	
Alatna R.	1 lodge	

^a NPS encourages nonconsumptive use of Kobuk Valley Park, so these lodges may offer more for the sightseer than the angler.

